

LISTED SPECIES/CRITICAL HABITAT

American peregrine falcon

Direct effects

Species

Numbers and reproduction

Properly implemented conservation measures should ensure that the risk of direct adverse impacts to peregrine falcons resulting from PALCO timber operations and other covered activities is insignificant. Conservation measures are intended to detect nest sites prior to implementation of covered activities that could adversely affect these sites due to disturbance, or due to habitat modification in the immediate proximity (within 500 feet) of the eyrie. For all present and future occupied nest sites, no timber operations may occur closer than 0.5 mile during the breeding season, or within 1 mile for activities capable of introducing loud noise. Based on these considerations, the proposed action is not likely to affect the number or reproduction of peregrine falcons.

Distribution

The proposed project is not anticipated to result in significant changes to the distribution of peregrine falcons at any landscape scale. The risk of direct adverse effects to any of the known or potential nest sites is anticipated to be insignificant, as none of the covered activities are likely to result in structural changes to any of the known or potential nest sites. Surveys implemented as part of the conservation measures should identify any active nest sites prior to implementation of timber operations. Maintenance of nest sites should ensure that no significant changes to the distribution of peregrine falcons occurs at the action area or any larger scale. Based on these considerations, the proposed action is not likely to affect the distribution of peregrine falcons.

Injury or disturbance

Activities such as rock climbing; use of chain saws, explosives or aircraft; construction activities; vehicular access; and timber harvest during the nesting season can disturb nesting peregrines, resulting in the abandonment of nesting attempts or nesting sites. Activities during the non-nesting season would not result in significant adverse effects of peregrine falcons. The objective of the conservation measures for the peregrine falcon is to provide for a high probability of successful nesting of peregrine falcons. Given full implementation of these measures, activities directly associated with timber operations are likely to result in a low likelihood of significant disturbance to occupied nests. If these conservation measures are implemented during all timber operations, disturbance to occupied nest sites from these activities is likely to be an insignificant risk to the species. Therefore, based on these considerations, the proposed action is not likely to affect the peregrine falcon through injury or disturbance.

Suitable habitat

Habitat loss or modification

The foraging area for the known nest site is unknown. Based on its location near the edge of the property, it is reasonable to expect that only a portion of the foraging area is on the property. The

proposed action will likely result in the harvest of forest stands within the foraging zone around existing and future peregrine falcon nest sites, although no timber harvest would be allowed within 500 feet of active nest sites to protect the integrity of those nest sites. Since peregrine falcons normally forage on prey species in flight over a variety of wetland, forest, shrubland and riparian habitats, they would not be directly affected by forest stand structure or seral stage. However, peregrines are likely to be adversely affected due to changes in prey abundance and availability immediately following timber harvest within foraging range of occupied nest sites. Prey species abundance and composition is likely to be substantially changed as late-successional forests are clearcut, resulting in landscape patches with sparse vegetation prior to reestablishment of forest stands and associated early seral vegetation. As early seral vegetation is reestablished, and plant abundance and species diversity increases, corresponding abundance and diversity of prey species is likely to once again increase to levels similar to those of late-successional stands, albeit with a new prey species composition (see also indirect effects, below). Thus, to the extent that the foraging area includes the property, the peregrine falcon is likely to suffer adverse effects associated with changes to prey species abundance and availability as a direct result of timber operations within foraging range of present and future nest sites.

Indirect effects

Although peregrine falcons are not dependent upon prey species directly associated with late-successional and/or old-growth forest habitat, and, in this location, may be deriving prey from other habitat types off the property, the overall prey base (and their relative availability) may change with changes to the seral stage distribution of forests within foraging range of eyries. Both early seral forest habitats and late-seral/old-growth forest habitats are generally acknowledged to provide higher numbers of vertebrate fauna, including avian prey species, than do mid-seral forest stands. As forest seral stage changes from early seral (through regrowth of young stands) and late-seral (through timber harvest and other means, and subsequent regrowth) to mid-seral conditions, prey biomass and prey species diversity are likely to decrease. Prey availability may also change. As a result, to the extent that the foraging area includes the property, peregrines may suffer adverse effects due to changes in prey abundance and availability as intensively managed forest stands change from relatively more diverse late-seral and early seral stages to more uniform and biologically simpler mid-seral conditions.

The HCP/SYP does not provide for future road access management or other restrictions on human intrusion into the 0.5 mile zone around occupied nest sites that may be expected to occur as a result of other activities during the 50 year life of this plan, including but not limited to vehicular access. These types of activities, especially early in the nesting period, have the potential to adversely affect nesting peregrines through disturbance at the nest site. The likelihood of nesting peregrines abandoning the nesting attempt, or even the nest site altogether, increases with the number and intensity of disturbance events. However, the known site is not directly exposed to forest roads and the terrain is not favorable for road construction. Even so, it is possible that the proposed action may adversely affect peregrine falcons due to future disturbance from noise above ambient levels and human presence associated with a variety of activities.

Northern spotted owl

Direct effects

Species

Numbers

The proposed action could affect the numbers of spotted owls both on PALCO lands and the action area outside of the PALCO lands through two primary mechanisms: modification of habitat within owl home ranges by timber harvest and related activities, and disturbance of reproductive efforts by such activities within proximity to activity centers. The most immediate effect of either of these mechanisms would be expected to occur as a lowered reproductive rate, and later, as a reduced rate of juvenile and adult survival, or increased emigration. The net result would be a lower population size on the property and the action area. As described in more detail below, at least 108 activity centers would be maintained at all times throughout the permit period (50 years); this would allow a reduction of approximately 31 percent from the existing population level of 156 activity centers. The proposed action would result in changes in the number of activity centers found in the action area outside of the PALCO lands only if there are substantial effects on portions of home ranges that extend onto PALCO lands. The degree of this effect is unknown. Even at the minimum level provided by the HCP, the remaining owl population on PALCO's property would exceed the goal of 60 pairs established for the entire southern Humboldt - northern Mendocino area by the northern spotted owl Recovery Team in the draft Recovery Plan (USDI 1992).

The FWS believes that the goals established by the draft Recovery Plan for non-Federal lands are still valid, although the Northwest Forest Plan now guides management of Federal forest lands. The Northwest Forest Plan provides for more protected owl sites on Federal lands than were contemplated under the draft Recovery Plan. The Northwest Forest Plan did not make recommendations for non-federal lands, but because the level of protection is now higher on Federal lands, and densities are high on non-Federal lands in the Coast Province, the FWS believes that the Recovery Plan standard is still adequately protective for this region.

At a wider perspective, the FWS recognizes that the impacts of actions approved elsewhere in the range should be evaluated to determine whether they might alter the Service's conclusions about the recovery needs for the NSO in the Coast Province stated in the draft Recovery Plan. All federal actions covered by the Northwest Forest Plan have been subject to consultation under Section 7 of the Act, and the FWS has not discovered impacts on NSO populations that were not contemplated under the Northwest Forest Plan. The so-called "318 sales", which removed habitat in areas not planned for harvest under the Northwest Forest Plan, did not occur in California and had relatively insignificant impacts on northern spotted habitat (USDI Fish and Wildlife Service et al. 1997). In addition, ten HCPs affecting the northern spotted owl have been completed since 1992. Two HCPs in California cover 380,500 acres of nonfederal lands and allow incidental take of 52 spotted owl sites. Three Oregon HCPs cover 302,106 acres and allow incidental take of 36 spotted owl pairs and spotted owls associated with 22,000 acres of nesting, roosting and foraging habitat. In Washington, five HCPs covering about 1.83 million acres allow incidental take of 251

owl pairs, juveniles, and/or territorial singles. All of these plans have been completed with a view toward meeting the local needs of the species within the context of management on Federal lands, and have also been subject to consultation under the Act. Their effects have been incorporated into the range-wide baseline for the species that is considered in this biological opinion. The consideration of the status of the baseline does not alter our conclusion regarding the continuing validity of the Recovery Team's assessment. Therefore, the FWS believes that the recommendations of the Recovery Team contained in the draft recovery plan for non-Federal lands in coastal California are still valid.

Distribution

Northern spotted owl activity centers would remain generally distributed throughout PALCO lands. Some current gaps would continue to exist in the distribution of northern spotted owl activity centers on a watershed basis. Future gaps in the distribution of activity centers would not be considered significant because dispersal conditions and total numbers of activity centers on PALCO lands would still allow movements and interaction between occupied sites. The retention of an adequate distribution of activity centers would benefit the northern spotted owl by enhancing interaction with owls on PALCO lands and in the action area.

Reproduction

An objective of the SYP/HCP's spotted owl conservation plan is to maintain an average reproductive rate of at least 0.61 fledged young per pair. The target rate represents the average observed on PALCO lands during the period 1994 to 1998, under complete no-take protections. Therefore, the reproduction rate is not expected to differ from that previously observed. This rate is slightly lower than that observed on neighboring lands (Franklin 1998a, Simpson Timber Company 1998). The total number of young produced on the property is expected to decline in proportion to the decline in the overall population level discussed below. Spotted owl reproduction (i.e., number of young per nesting pair) will be monitored and a Scientific Review Panel, in conjunction with the FWS and CDFG, will review potential reasons for failure to achieve the objective, then develop and implement corrective measures. Additional demographic data would be needed to determine the influence of the proposed action on the intrinsic rate of population growth or decline (i.e., λ); however, maintenance of a sufficient population size and reproductive rate may indicate adequate performance of the population.

Injury or disturbance

In previous consultations conducted by the FWS, human presence and activity within 0.25 mile (1,320 feet) of known or suspected activity centers was assumed to adversely affect behavioral patterns of the northern spotted owl during the breeding season (February 1 to July 31, as defined by the FWS). Noise exceeding ambient levels was assumed to adversely impair essential behavioral patterns, including breeding, feeding, or sheltering (i.e., disturbance). Timber felling within 0.25 mile of activity centers has been assumed as having the likelihood of injuring or killing individuals. However, field experience has indicated that in many cases, breeding has been successful under conditions that do not comply with these assumptions, especially where the potentially disturbing effect is relatively minor, or where owls are acclimated to activity.

The SYP/HCP's spotted owl conservation plan addresses the potential for injury or disturbance by requiring completion of three-visit surveys of all timber harvest operations to determine the presence and status of spotted owls within 1,000 feet of all timber harvest units; and precluding timber harvesting between March 1 and August 31 within 1,000 feet of all activity centers where breeding activities are underway. The FWS believes that these measures are likely to effectively minimize disturbance in most cases. Disturbance could still result if surveys fail to detect owls that are actually breeding in proximity to activities, or if the 1,000 foot distance is not sufficiently protective for certain individual owls, or if owls initiate breeding prior to March 1 (which is unlikely based on local experience). Thus, an undeterminable number of spotted owls may be subject to disturbance, injury, or death as a result of the proposed action, but the overall effect on breeding owls is expected to be reduced.

At activity centers that are not subject to Level One or Level Two protection, and where breeding activities are not underway, timber harvest could occur. This would be expected to disturb and displace the adult owls inhabiting the site, but not result in direct injury, since the adults are capable of leaving the site. Based on experience under the Simpson HCP, some of these displaced owls may establish nearby breeding territories in subsequent years, while others may become reproductively inactive (Simpson Timber Company 1997).

Suitable habitat

Habitat protection

Effects on habitat are evaluated at the landscape scale and at the scale of individual activity centers. Habitat important for northern spotted owls in the action area consists of both early seral forests that produce quantities of dusky-footed woodrats (the owls' primary prey), and old-growth, late-seral, and mid-seral forests that provide the owls cover for breeding, roosting and foraging. With the exception of old-growth, most owl habitat stages will be provided on a rotation basis as young stands develop from the forage-production stage to older stages providing cover requirements, and are eventually harvested and returned to early stages. Protected old-growth stands and RMZ stands will provide foraging habitat on a permanent basis. Although the RMZs may be too narrow to provide good nesting habitat during periods when they are bordered by new clearcuts and young forest stages, they should provide nesting habitat while they are bordered by mid- and late-seral stages.

At the landscape level, the proposed timber harvest will continually create the early seral stages that provide owl prey. The amount of early seral forest on the property is expected to vary from 43,021 acres at year 0 to 58,066 acres at year 50 (USDI Fish and Wildlife Service and California Department of Forestry and Fire Protection 1999, table 3.9-1, page 3.9-2). Insufficient information is available to evaluate the occurrence of this habitat element around individual activity centers, but it is assumed that the dispersion of young stands will be adequate to provide a source of prey species for owl activity centers throughout the ownership.

Because older timber stands that provide the best quality nesting habitat are also the focus of harvest activity, their protection, regeneration and maintenance are of elevated concern. At the

landscape scale, several conclusions may be derived. About 9,000 acres of high quality uncut old-growth and residual old-growth owl breeding habitat will be provided in the Headwaters acquisition and in the MMCAs. The proposed action would provide for a total of 177,173 acres of suitable habitat on PALCO lands at the end of 50 years, an increase of 6,769 acres compared to current levels (table 51).

Table 51. Projected acres of suitable northern spotted owl habitat on PALCO lands over 50 years (data from PALCO 1999).

Habitat type	Decade						Net change
	0	1	2	3	4	5	
High quality nesting	58,783	37,688	25,129	23,737	28,850	37,098	-21,685
Medium quality nesting	35,223	29,249	50,732	62,283	64,427	73,716	38,493
Low quality nesting	537	1,114	117	19	19	28	-509
Roosting	40,302	45,721	36,540	28,238	31,740	19,365	-20,937
Foraging	35,558	53,540	53,728	60,836	47,471	46,966	11,408
Total:	170,404	167,313	166,247	175,112	172,506	177,173	6,769

Depending on the outcome of watershed analysis and establishment of RMZ prescriptions, between 3,695 acres and 21,304 acres (refer to tables 34 and 35 in the **Effects Common to Species Associated with Late-Seral Habitat**) of potential breeding habitat will exist in RMZs. This estimate assumes all stands in RMZs will become suitable within 50 years. The quality of this habitat may be limited by the lack of interior forest and high amount of edge while surrounding stands are in lower seral stages. RMZs located next to substantial blocks of suitable habitat may better contribute to the habitat needs of the spotted owl, especially breeding.

At the level of activity centers, a substantial amount of suitable habitat would be provided around the 80 activity centers, based on Level One protection measures. Estimates of habitat protected in the vicinity of activity centers are imprecise because of an unknown degree of overlap in home ranges of neighboring owls and overlap between locations of activity with various land allocations such as MMCAs and RMZs. (For example, if activity centers share overlapping habitat at a factor of 50 percent, the amount of habitat provided under Level One would be about 53,000 acres). Projections of the amount of high quality and medium quality owl nesting habitat that will be available during various decades are presented in table 51.

Habitat removal and modification

In past consultations on proposed activities that might affect the northern spotted owl, the Service has assumed that the behavioral patterns of the species may be significantly affected when the

amount of "suitable" habitat is reduced below 1,336 acres within 1.3 miles and below 500 acres within 0.7 mile of the activity center. Suitable habitat is generally defined as including mature and old-growth forests. These thresholds were based on studies conducted on US Forest Service lands in the interior of northern California (e.g., Solis 1983, Sisco 1990, Paton et al. 1990). Based on home-range sizes reported in these studies, past consultations have assumed that activity centers with less than the above threshold amounts of mature and old-growth habitat are not capable of maintaining northern spotted owls over the long-term.

This biological opinion for the SYP/HCP will also use these thresholds as an indicator of possible effects. However, in the light of the observed high densities of northern spotted owls on the PALCO ownership and neighboring ownerships, and because abundant prey are produced in lower seral stage stands in the coastal region, it is likely that home ranges in the coastal region are substantially smaller than those measured further inland. Therefore, the anticipation that adverse effects would occur if habitat levels are reduced below the above-stated threshold is regarded as a worst case. Although no specific data are available to determine a more realistic threshold for the coastal region, it is likely that a substantial portion of the population would persist on the property with a lower amount of forested habitat than that expressed by the above habitat threshold.

Habitat removal and modification may affect activity centers, both on the PALCO ownership and in the surrounding action area. On PALCO lands, a minimum of 80 activity centers will be retained under Level One protection, which would provide habitat in amounts equal to or greater than the above-stated habitat quantities of 1,336 acres within a 1.3 mile radius and 500 acres within a 0.7 mile radius. At all times, at least 28 more activity centers will be provided Level Two protection, which will leave at least 18 acres of nesting-quality habitat around activity centers. Monitoring and adaptive management would ensure that at least 108 activity centers are maintained on the property, with a reproductive rate equivalent to that in existence prior to the SYP/HCP. Since the existing population consists of approximately 156 activity centers, the number of activity centers on the PALCO property, and the associated owl population, could be reduced by approximately 31 percent. The decline would be greatest during the first 20 years, the peak period of timber harvest. The potential loss of these sites would have an adverse effect on the local spotted owl population, due to a decrease in the size (i.e., number of individuals) and reproductive output (i.e., total number of young produced) of the population. The remaining spotted owl population on PALCO lands, however, would still far exceed the population goal of 60 pairs for the southern Humboldt - northern Mendocino area recommended by the Northern Spotted Owl Recovery Team (USDI 1992a).

In the action area outside of the PALCO lands, an undetermined portion of the approximately 259 spotted owl activity centers in that area may be affected by modification of habitat on PALCO lands if their home range extends onto PALCO property. The potential loss of these sites would have an adverse effect on the local spotted owl population, due to a decrease in the size (i.e., number of individuals) and reproductive output (i.e., total number of young produced) of the population.

The SYP/HCP's spotted owl conservation plan addresses the retention of habitat in the vicinity of spotted owl activity centers. Habitat modification around 80 activity centers will be limited by Level One Protection measures that conform with the above threshold criteria and are assumed to be adequate to assure retention of activity centers. The remaining specified habitat retention requirements (i.e., Level Two Protection measures - 18 acres of nesting habitat around the activity center; sites other than Level One or Two Protection measures - no acres specified) will not conform with the above threshold levels. However, the requirement to maintain at least 108 activity centers with an average of 0.61 young per pair would be expected to act as a constraint to harvesting habitat down to minimum levels around activity centers, especially if monitoring results indicate that sites with low habitat levels are not performing adequately. In the worst case, habitat removal and modification could occur to a degree sufficient to reduce the population to 108 activity centers and 82 pairs -- about 69 percent of its existing level.

The proposed action, however, would result in a net gain (a benefit to the owl) of 6,769 acres of suitable habitat at the end of 50 years, an increase of 3.9 percent from the total of 170,404 acres. Habitat quality, however, would shift as follows: high quality nesting, a reduction of 37 percent; moderate quality nesting, a gain of 109 percent; low quality nesting, a loss of 95 percent; roosting, a loss of 52 percent; and foraging, a gain of 32 percent (table 51). Overall, high and moderate quality nesting habitat increases slightly (16,798 acres), compared to current levels (94,006 acres). Although the quality of nesting habitat is generally reduced from high to moderate, the net increase in nesting habitat is a benefit to the owl.

The proposed action would remove or modify the following acres of mid- and late-seral forests (including old-growth and residual Douglas-fir or redwood), by prescription category: clearcut - 18,474 acres; commercial thin - 3,232 acres; selection - 20,032 acres; shelterwood restock - 400 acres; and shelterwood seed step - 105 acres. All canopy cover classes are included in this estimate, therefore, these data may overestimate the effect. Both mid- and late-seral forests are suitable habitat for the spotted owl.

Habitat fragmentation

Fragmentation (e.g., changes in the number, size, configuration, and distance between forest stands) of suitable spotted owl habitat was not quantified for the purpose of this consultation. However, the trend in fragmentation of suitable owl habitat is likely to be similar to that of LSH, since LSH is a subset of suitable owl habitat (refer to the distribution and fragmentation discussion under **Effects common to species associated with late-seral habitat**). The fragmentation of suitable habitat is often considered an adverse effect due to the potentially increased energy required to move from one patch of suitable habitat to another and the increased edge effects (e.g., reduced interior forest conditions, increased predation, decreased microclimate). However, Franklin (1998b) found that the amount of edge between cover habitat and forage-producing early seral stages was a positive factor in owl performance.

Habitat distribution

Although the quality of suitable habitat is expected to change over time (table 51), suitable habitat would remain distributed throughout PALCO lands as a result of continuing timber harvest and growth. Throughout the 50-year permit period, forested lands in each WAA will include at least 10 percent late-seral, 5 percent mid-successional, and 5 percent young forest. Measures to maintain habitat diversity would provide for retention of snags and logs that would provide potential nesting structures and habitat for prey species distributed across the landscape.

Suitable spotted owl breeding habitat on the PALCO lands at a minimum is comprised of mid- and late-seral stages. At least 15 percent of the forested area in each watershed would occur as suitable breeding habitat throughout the permit period. The area of PALCO lands by WAA is summarized as follows (Final EIS/EIR, table 3.4-2): Humboldt Bay - 38,985 acres; Mad River - 3,904 acres; Yager - 33,730 acres; Van Duzen - 29,934 acres; Eel - 73,862 acres; and Bear-Mattole - 30,580 acres.

Removal of special habitat components.

Refer to the discussion under **Effects common to species associated with late-seral habitat.**

Dispersal habitat condition

The spotted owl conservation plan does not directly address the retention of dispersal habitat. Measures described to conserve habitat diversity (e.g., seral stage distribution), in combination with habitats found on lands where intensive timber management would be constrained (e.g., RMZs, MMCAs, etc.), would be expected to provide dispersal habitat conditions. The proposed action would reduce the amount of dispersal habitat from 145,532 acres to 121,392 acres (based on Final EIS/EIR, table 2.6-1) at the end of 50 years, a reduction of about 17 percent. At the end of 50 years, dispersal habitat would comprise about 57 percent of the PALCO lands. The reduction in dispersal habitat would be considered an insignificant effect because more than 50 percent of the ownership would provide adequate dispersal conditions.

Indirect effects

Predation, habitat loss or modification, and injury or disturbance

Although the species is not strictly associated with LSH in coastal California, the reduction in LSH under the proposed action could indirectly affect the northern spotted owl, through increased predation, habitat loss or modification, and injury or disturbance. These effects are similar to those described for late-seral associated species. Refer to **Effects Common to Species Associated with Late-Seral Habitat** section above for further discussion on potential indirect effects on spotted owls.

In particular, concern exists regarding the presence of barred owl (*Strix varia*) populations in the action area, and the possibility that timber harvest may favor this competitor of the northern spotted owl. Barred owl populations are expanding throughout northern California (Dark et al. 1998), and the species has been located at 12 sites on the PALCO ownership (Draft SYP/HCP, Section IV, Part C, page 2). At this time, the factors that may favor this expansion are not well understood.

Bald eagle

Direct Effects

Species

Numbers, distribution, and reproduction,

The objectives of the bald eagle conservation plan are to implement nest site identification and protection measures which have a high probability of providing for successful nesting of bald eagles and to minimize disturbance of foraging bald eagles. The conservation plan addresses the following as a means for achieving the objectives: surveys to determine the presence and nesting status of bald eagles; measures to protect habitat and to limit disturbance in the vicinity of active nest trees; measures to avoid disturbance of wintering eagles; and monitoring of nest sites.

Active bald eagle nest sites are not known to occur on PALCO lands or in the action area, therefore, the proposed action would not directly affect any known active nest sites. Few nests are likely to occur on the PALCO lands in the future, based on the size of the nesting population in the action and regional areas. Proposed survey measures focus on the detection of bald eagles in THPs within 0.5 mile of Class I waters that provide potential foraging habitat (i.e., primary nesting and roosting habitat) and provides for evaluation of potential habitat in all THPs and localized searches for nests and eagles if appropriate. The bald eagle conservation plan has a high likelihood of reducing disturbance and maintaining the integrity of the nest tree and immediate area in primary nesting habitat if nest sites are detected. A small likelihood remains that nests might go undetected in timber harvesting, planning, in which case disturbance of an unknown nest could result. The rationale and significance of these effects are discussed in the following sections.

Injury or disturbance

In past consultations, we have determined that the following activities may disrupt essential behavioral patterns of nesting eagles when within the specified distances of eagle nests: blasting within 1.0 mile; use of helicopters within 0.5 mile; and use of motorized equipment within 0.25 mile, unless the activity is line-of-sight, and then the distance is 0.5 mile. The bald eagle conservation plan contains measures that would reduce the likelihood of disturbance by helicopters either in nest surveys or in timber yarding.

In addition, the FWS has determined that the use of motorized equipment, helicopters, or aircraft within 0.25 mile of wintering areas may disrupt wintering behavior. The bald eagle conservation plan addresses measures to reduce disturbance to winter foraging eagles. These measures are likely to reduce the disturbance of eagles found perched or foraging or night roosting near Class I streams, thus meeting the conservation objective. The plan, however, does not address disturbance of wintering roosting eagles that could occur elsewhere on the PALCO lands, due to the use of motorized equipment, helicopters, or aircraft. The plan does not require surveys to detect wintering roost sites.

In summary, while the proposed action could directly affect either the number, distribution, or reproduction of nesting bald eagles, or result in disturbance of nesting or wintering eagles, the

likelihood of such effects is expected to be low. The general effects of disturbance are discussed in the **Effects Common to Species Associated With Late-Seral Habitat**. An undetermined number of nesting eagles and at least 11 wintering eagles may be affected at a low level of likelihood. Any reduction in the number, distribution, and reproduction of bald eagles would be considered an adverse effect, but because the number of eagles using the property are a very small fraction of the nesting or wintering population of the Pacific Recovery Region, these effects would not be substantial.

Suitable habitat

Habitat protection

Suitable bald eagle habitat on PALCO lands would be protected (i.e., no timber harvest) as follows: MMCAs (primary nesting/roosting - 1,654 acres; secondary nesting/roosting - 5,262 acres; and wintering - 5,788 acres), no harvest buffers of RMZs (between 3,695 acres and 21,304 acres, refer to tables 34 and 35 in the **Effects Common to Species Associated with Late-Seral Habitat**), and the Headwaters Reserve (primary nesting/roosting - 3,115 acres; secondary nesting/roosting - 3,783 acres; and wintering - 5,304 acres). The acreage estimate for RMZs assumes all acres are suitable habitat. Acreage estimates were not added because overlap between areas was not considered. An undetermined amount of suitable eagle habitat (all categories) also would be protected in areas subject to silvicultural restrictions (e.g., adjacent to protected spotted owl activity centers and mass wasting areas). The additional amount of protected habitat could not be determined for the purpose of this analysis. Protection of suitable habitat in these areas would benefit the bald eagle by providing nesting, roosting, and wintering opportunities. For a general discussion on habitat protection in the action area, refer to **Effects Common to Species Associated with Late-Seral Habitat**.

Habitat modification

The bald eagle conservation plan allows for timber management within 500 feet of an active nest, but such harvest would be limited to prescriptions that enhance long-term eagle habitat. Impacts on the loss or changes in habitat quality could not be determined for the purpose of this consultation, due to a lack of site specific information.

Although the bald eagle conservation plan provides habitat for winter foraging use in RMZs, it does not address the protection of winter roosting habitat. If roosting sites are harvested, wintering eagles may be displaced to other suitable sites on or off PALCO lands, and the quality of wintering habitat used by at least 11 eagles may be reduced. The loss of wintering habitat and displacement of wintering eagles would be considered an adverse effect, but the number of eagles using the property is a very minor portion of the Recovery Region's wintering population, so this effect would not be substantial.

Habitat removal and modification

The proposed action would remove or modify the following acres of late-seral forests (including old-growth and residual Douglas-fir or redwood), by prescription category: clearcut - 35,319 acres; commercial thin - 3,935; selection - 27,253 acres; shelterwood restock - 1,730 acres; and

shelterwood seed step - 1,010 acres. Potential effects associated with this modification have been discussed in previous sections.

Suitable bald eagle nesting habitat (all habitat categories combined) would decline from 69,231 acres to 39,940 acres over the permit period (Refer to table 36 in the **Effects Common To Species Associated With Late-Seral Habitat**).

Habitat distribution

Suitable bald eagle habitat is generally comprised of late-seral stages. Therefore, at least 10 percent of the forested landscape in each WAA would remain as suitable habitat throughout the permit period. The proposed action would provide for at least 20,598 acres of suitable habitat, distributed as follows by WAA (based on Final EIS/EIR, table 3.4-2): Humboldt Bay – 3,898 acres; Mad River – 390 acres; Yager – 3,373 acres; Van Duzen – 2,493 acres; Eel – 7386 acres; and Bear-Mattole – 3,058 acres.

Habitat fragmentation

Refer to the discussion under **Effects Common to Species Associated with Late-Seral Habitat**.

Removal of special habitat components

Outside riparian management zones and nest protection areas, timber harvest could reduce the quantity and quality of special habitat components such as snags which eagles may use for roosting or perching. The number of these components likely to be removed cannot be quantified. The retention requirements for snags, as previously described in the description of the proposed action, may minimize the impact of the action depending on the height of snags retained. Taller snags would benefit the eagle the most. The significance of the loss of special habitat components depends on their location relative to nesting, roosting, perching, and feeding areas. If these components are used by eagles or are located next to bald eagle nest, roost, perch, or feeding sites, their loss may be an adverse effect, but since such features would be protected in primary use areas, the effects are expected to be minimal.

Indirect effects

Injury, disturbance, habitat loss or modification

Refer to **Effects Common to Species Associated with Late-Seral Habitat** for potential indirect effects on bald eagles.

Implementation of the aquatic species conservation plan may increase the prey base (e.g., fish) of nesting or wintering eagles, due to improved riparian conditions. The extent to which bald eagles will respond to improved aquatic conditions is unknown at this time. Any increase in the number of nesting or wintering eagles detected during future survey and monitoring efforts and attributed to increased prey base on PALCO lands would be considered a beneficial effect.

Marbled murrelet

For the purposes of this analysis, the proposed action is the granting of a section 10 permit to PALCO and the permanent acquisition of the Headwaters and associated stands. Therefore, the following analysis of effects on the murrelet includes consideration of the harvest proposed in the SYP/HCP as well as the permanent set aside of acquired areas and the conservation of other PALCO lands for the SYP/HCP permit period.

The primary adverse impact to the murrelet will be through loss of nesting habitat in the first 10 years of the permit period, and there could be some direct mortality of murrelets if timber harvest occurs in nesting habitat during the nesting season; these impacts are described below. Direct and indirect effects to murrelets and suitable murrelet habitat were measured first, which were then applied to estimating the short term and long term adverse and beneficial impacts on the species' numbers, distribution, and reproduction.

The short-term loss of nesting habitat will likely have the most significant adverse effect on the murrelet, while the long-term development and maintenance of additional high quality habitat in large contiguous reserve areas should provide benefits to the species. The FWS took the following steps to evaluate these various effects:

1. Using information provided in the Environmental Baseline, quantify the respective area of suitable murrelet nesting habitat that will be either removed through harvest or protected in the acquired Headwater stand and SYP/HCP reserves.
2. Divide this harvested or protected suitable murrelet habitat into relevant habitat types: UOG, ROG, and DFOG.
3. Assess the relative value of these three habitat types to the marbled murrelet, and quantify the amount of habitat protected and removed within each habitat type.
4. Enumerate and assess the adverse effects of the proposed harvest on the species.
5. Enumerate and assess the long term beneficial effects of the SYP/HCP and the permanent acquisition of the Headwaters stand.
6. Summarize, quantify, and assess the relative adverse and beneficial impacts of the proposed action on the survival and recovery of the marbled murrelet.

Direct and Indirect effects

Suitable Habitat

Habitat Protected and Removed

Based on the updated data provided to the FWS (appendix A, T. Reid, pers. comm., January 11, 1999) and some recent revisions from PALCO (S. Chinnici, pers. comm., January 19 and January 25, 1999) that have been confirmed by the FWS, the proposed action will result in the protection of 9,056 acres of suitable nesting habitat and will release for harvest approximately 15,213 acres (table 52)¹. The protected habitat will be preserved permanently in the Headwaters acquisition area, or in MMCAs for the life of the permit. These acreage figures include all confirmed or potential suitable murrelet habitat, including 8,519 acres of low quality and mostly unoccupied Douglas-fir habitat. Table 53 presents data on redwood forest types only; of the 15,749 acres of suitable murrelet habitat in redwood forests, 6,909 acres (44 percent) is proposed for harvest and 8,840 acres will not be harvested (66 percent). The majority of this harvested habitat, assuming it is not protected in riparian reserves or otherwise restricted, is expected to be removed within the first 5 to 0 years of the permit period, which would have an immediate adverse effect on the species.

It is important to note that the above estimate of harvest of murrelet habitat, and several similar analyses in following sections, did not deduct the habitat acreage that would be released from harvest restrictions related to murrelets, but would remain encumbered by riparian and other restrictions. These acreages were not available until late in the completion of this biological opinion, and are not accounted for in most data tables in the following sections of this opinion. (They are, however, mentioned in footnotes where appropriate). This general reduction in effect of harvest is summarized here and should be borne in mind in consideration of analyses that follow. Approximately 4,775 acres of old-growth forest (UOG (159 acres), ROG (2,387 acres), and DFOG (2,229 acres)) released from murrelet restrictions (i.e., included within the 15,213 acres included in the total "harvest" estimates for this opinion) will not be harvested or will be only partially harvested, because it is protected under the aquatic conservation strategy. Although some of this reserved habitat may continue to harbor murrelets after adjoining areas are harvested, the FWS considers it adversely affected because of impacts due to stand fragmentation, increases in edge, and stand size reduction. These retained old-growth riparian areas may have future value to the murrelet if adjoining second growth stands are allowed to grow to a size class where they can buffer these older trees and provide some interior forest conditions.

The proposed action will result in the removal of known occupied nesting habitat, unsurveyed potential nesting habitat, and surveyed but unoccupied suitable nesting habitat for the marbled murrelet. Estimates of habitat removed and protected is organized by habitat type and murrelet occupancy status and is presented in table 54.

¹ This estimate assumes the Grizzly Creek complex is not harvested, per the description in the ITP of this biological opinion.

Table 52. Potentially suitable murrelet habitat proposed for protection (i.e., MMCAs and Headwaters) and potential harvest. Totals include all potentially suitable murrelet habitat in redwood old-growth and Douglas-fir forests: known occupied, known unoccupied, and unsurveyed but potentially suitable murrelet habitat.

Habitat Type	Harvest	Protect	Total Acres
Unentered Old-growth Redwood (UOG)	446	4,693	5,139
Residual Old-growth Redwood (ROG)	6,463	4,147	10,610
Old-growth Douglas-fir (DFOG)	8,304	216	8,520
Total Acres	15,213*	9,056	24,269

* NOTE: This estimate of total harvested acres does not correct for the approximately 4,775 acres of unentered old-growth and residual forest within riparian areas (RMZs) but outside of reserves that will be protected from harvest to varying degrees (O. Rand, pers. comm., GIS biologist, Foster Wheeler, February 4, 1999). Approximately 159 acres of UOG, 2,387 acres of ROG, and 2,229 acres of DFOG are in riparian reserves. Total unencumbered harvest is 10,438 acres of old-growth and residual.

Table 53. Potentially suitable murrelet habitat on Pacific Lumber lands proposed for protection (i.e., MMCAs and Headwaters) and potential harvest. Totals include all potentially suitable murrelet habitat in redwood old-growth forests: known occupied, known unoccupied, and unsurveyed but potentially suitable murrelet habitat. Updated source data from Appendix 1 and S. Chinnici, (pers. comm., January 25, 1999).

Habitat Type	Harvest	Protect	Total Acres
Unentered Old-growth Redwood (UOG)	446	4,693	5,139
Residual Old-growth Redwood (ROG)	6,463	4,147	10,610
Total Acres	6909*	8,840	15,749

* NOTE: This estimate of total harvested acres does not correct for the approximately 159 acres of UOG and 2,387 acres of ROG within riparian areas (RMZs) but outside of reserves (MMCAs) that will be protected from harvest to varying degrees (O. Rand, pers. comm., GIS biologist, Foster Wheeler, February 4, 1999). Total unencumbered harvest in UOG is 287 acres and in ROG is 4,076 acres. Assumes protection of Grizzly complex.

Table 54. Acreage estimates of unoccupied, occupied, and potential but unsurveyed murrelet suitable habitat on Pacific Lumber lands proposed for harvest or protection (i.e., MMCAs and Headwaters), respectively. Data from Final EIS/EIR, Appendix N2, tables 3A, 5A, and Appendix 1 (as updated by S. Chinnici, pers. comm., January 25, 1999). Adjustments of 1 to 2 percent were made to some figures to reconcile slightly different estimates from the various tables.

Habitat Type	MM Occupancy Status	Harvest	No Harvest
Unentered Old-Growth Redwood (UOG; 5,139 ac.)	Occupied ¹	446 ²	4,693 ²
Residual Old-Growth Redwood (ROG; 10,610 ac.)	Occupied	1,767 ⁴	3,750 ³
	Unsurveyed	4,320 ⁵	397
	Unoccupied	376 ⁵	0
	Subtotal	6,463 ⁶	4,147 ⁷
Old-Growth Douglas-fir (DFOG; 8,519 ac.) ⁸	Occupied	9	181
	Unsurveyed	4,563	0
	Unoccupied	3,731	35
	Subtotal	8,303	216
TOTAL ACRES	24,268	15,212⁹	9,056

¹ All UOG is presumed occupied.

² Appendix -1

³ Table 5A : 5517-2083+316 (December Extension, Appendix -1) = 3,750 occupied

⁴ Table 5A: 5517-3750²=1767

⁵ Table 5A:6533 - 1837 (unsuitable per S. Chinnici, January 25, 1999)- 376 (unoccupied per S. Chinnici, January 25, 1999) = 4334

⁶ Appendix -1: 8300 (residual) - 1837 (unsuitable per S. Chinnici, January 25, 1999)

⁷ Appendix -1

⁸ Table 5A and P. Detrich, January 2, 1999

⁹ NOTE: This estimate of total harvested acres does not correct for the approximately 4,775 acres of unentered old-growth and residual forest within riparian management areas (RMZs) but outside of reserves that will be protected from harvest to varying degrees (O. Rand, pers. comm., February 4, 1999). Total unencumbered harvest is about 10,438 acres of old-growth and residual.

Estimate of Confirmed and Likely Occupied Habitat Harvested

Using data from the above tables and the occupancy rates from the Environmental Baseline, the Service calculates that approximately 446 acres of occupied UOG, 4013 acres of occupied ROG, and 228 acres of occupied DFOG habitat will be harvested under the proposed SYP/HCP (table 55). Most of the highest quality occupied habitat will be conserved in a permanent Headwaters reserve or MMCAs: 91 percent of the occupied unentered old-growth redwood, and 50 percent of the known and likely occupied residual redwood.

Table 55. Combined acreage estimate of confirmed and likely occupied murrelet habitat proposed for harvest and no harvest. Acres as a percentage of the total amount within each habitat type are displayed in parentheses. Occupancy rates from Environmental Baseline were used to calculate likely occupied acres in ROG and DFOG.

Habitat Type	Harvest	No Harvest
UOG	446 ¹ (8.7 %)	4,693 ¹ (91.3%)
ROG ²	4,013 ³ (50%)	3,956 ⁴ (50%)
DFOG	237 ⁵ (57%)	181 (43%)
Total Occupied Acres	4,696 ⁶ (35%)	8,830 (65%)

¹ No occupancy rate applied. All UOG assumed occupied.

² Unknown how much of this ROG is >15 OG trees/ac and where it occurs. Assumed 95-100% unsurveyed residual is <15 OG trees/ac. and used 0.52 occupancy rate for both harvest and no harvest. Therefore, the total estimated here is 31 acres less than the total estimated in table 28, Environmental Baseline.

³ $1767 + 4320(0.52) = 4013$

⁴ $3750 + 397(0.52) = 3956$

⁵ $9 + 4563(0.05) = 237$

⁶ NOTE: This estimate of total harvested acres does not correct for the 159 acres of likely occupied UOG, 1,241 acres of likely occupied ROG, and 111 acres of likely occupied DFOG within riparian management areas (RMZs) but outside of reserves that will be protected from harvest to varying degrees (O. Rand, pers. comm., February 4, 1999). Therefore, approximately 3,185 acres of potentially occupied murrelet habitat will be released for unencumbered harvest.

Relative Habitat Quality Between Harvested and Protected Areas

The quality of murrelet nesting habitat varies across PALCO lands and within and between the three major habitat types (see discussion in Environmental Baseline). A goal of this SYP/HCP is to direct harvest away from the highest quality murrelet nesting habitat and -- to the greatest possible extent -- harvest the habitat of the lowest value to the species. This approach, which is consistent with other HCPs involving marbled murrelets (see, e.g., the Elliott State Forest HCP in Oregon and the WDNH HCP), is expected to reduce potential take and adverse impacts. To

evaluate whether the SYP/HCP is successful in meeting this goal, the Service measured the respective amounts and relative quality of murrelet habitat that would be released from murrelet restrictions or protected within MMCAs and the acquired Headwaters reserve.

The Environmental Baseline section presented background information on various habitat quality measures. The following analysis provides information on how much habitat in the various quality categories would be harvested or protected, respectively.

Occupied Habitat Harvested: The proposed action will allow harvest 35 percent and protect 65 percent of the known or likely occupied murrelet habitat on PALCO lands (including the Headwaters acquisition area). Approximately 91 percent of all occupied UOG, 50 percent of known or likely occupied ROG, and 43 percent of known or likely occupied DFOG on the ownership will be protected. Of the total amount of occupied habitat protected, 53 percent is UOG and is likely to be the highest quality habitat with the greatest density of nesting platforms and the highest rates of reproductive success (Swartzman et al. 1997).

The Environmental Baseline describes using occupancy data to assess relative habitat quality between different habitat types. Occupancy determinations may be made at different rates for different habitat types, suggesting that these habitats are preferred or utilized by murrelets at different rates. UOG is occupied by murrelets at a substantially higher rate than all other habitat types, and both types of ROG redwood are occupied at greater rates than the DFOG. All other stand characteristics being equal (e.g., stand size, shape, and degree of fragmentation), and assuming that murrelets are preferentially selecting certain stands to nest in (and exhibit occupied behaviors) and are avoiding less desirable habitats, it is reasonable to conclude that UOG is likely the more preferred habitat and is of relatively greater value to the species. This conclusion is consistent with the general hypothesis and supporting research suggesting that stands with more old-growth trees provide more nesting opportunities and better cover from predators and adverse weather (Ralph et al. 1995, page 7).

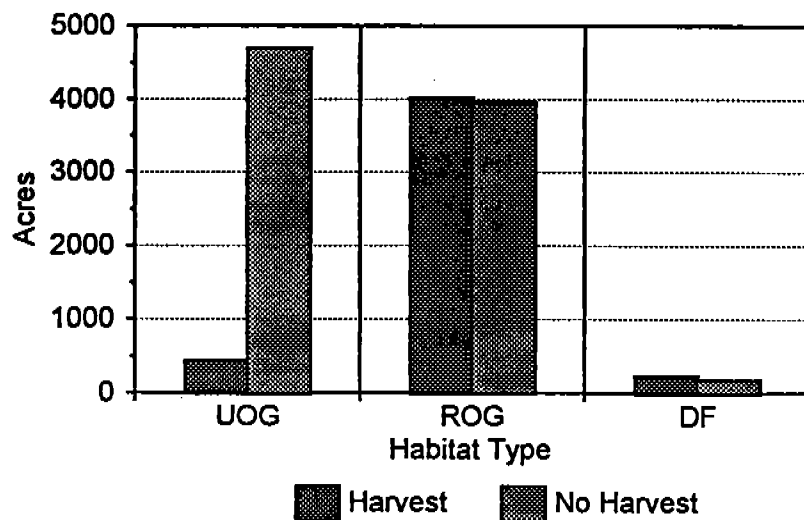


Figure 2. Respective amounts of known or likely occupied habitat acres proposed for harvest or protected within the UOG, ROG, and DF (i.e., DFOG) habitat types.

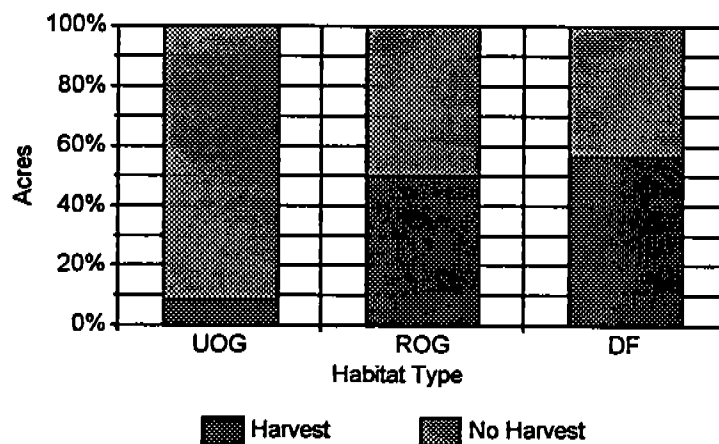


Figure 3. Respective percentages of known or likely occupied habitat acres proposed for harvest or protected within the UOG, ROG, and DF (i.e., DFOG) habitat types.

As figure 2 and figure 3 indicate, the FWS believes that the proposed action does an adequate job protecting known or likely occupied murrelet habitat, and — as measured by occupancy rates — it does a reasonable job of directing the harvest of occupied habitat away from the highest quality UOG and towards the lower quality ROG and DFOG habitat types.

Due to the low occupancy rates for the DFOG type described above, the data suggest that this habitat type is used by murrelets at very low levels. This observation is consistent with observations of Douglas-fir suitable habitat elsewhere in portions of California (Hunter et al. 1998), and known nest sites in California have a higher percentage of redwood trees than Douglas-fir even though some nests in these stands were in Douglas-fir trees (Hamer and Nelson 1995, page 75; Swartzman et al. 1997). Therefore, the FWS concludes that the DFOG habitat type has limited value to the murrelet on PALCO lands, and the following discussion of other habitat quality indicators focuses on UOG and ROG redwood types only.

Other measures of potential habitat quality are described below. Some of these measures may be directly correlated with occupancy rates, such as volume and canopy closure, but they also provide the potential to assess relative habitat quality within a given habitat type and evaluate where harvest and protection will occur.

Volume and stem density as an indicator of habitat quality: Timber volume density on PALCO lands (expressed in thousands of board feet per acre, or mbf per acre) is detailed in the Final EIS/EIR (Appendix N2, table 1.B, as updated by T. Reid). About 90 percent of the UOG stands exceed 100 mbf per acre, and 50 percent exceed 150 mbf per acre. In contrast, about 28 percent of the acres of ROG stands contain less than 25 mbf per acre, about 68 percent contain between 25 and 50 mbf per acre, and about 4 percent contain more than 50 mbf per acre (see figure 6, Appendix N2, Final EIS/EIR). Figure 4 illustrates the number of acres in six volume categories that are proposed for either harvest or protection, while figure 5 represents these data as a percentage of the total within each volume class. Both of these figures show that the majority of the acreage proposed for harvest occurs in the areas with the lowest volume density.

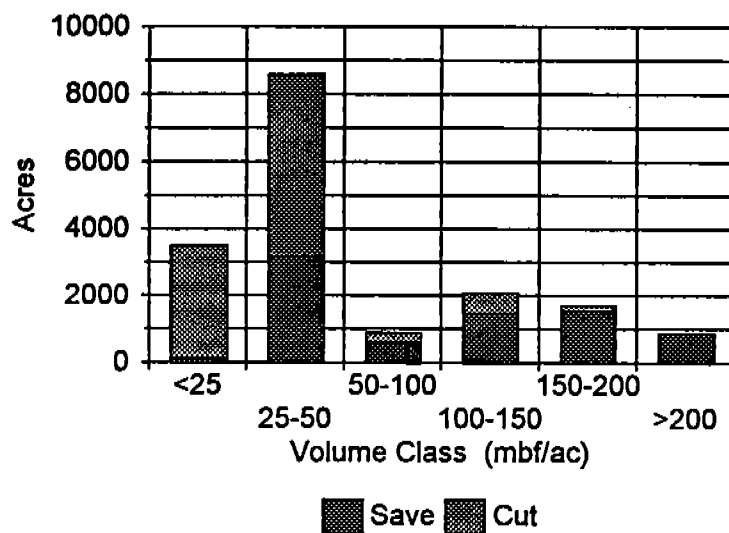


Figure 4. Acres of the suitable redwood old-growth habitat within each volume class (mbf/ac) proposed for harvest or conservation, respectively.

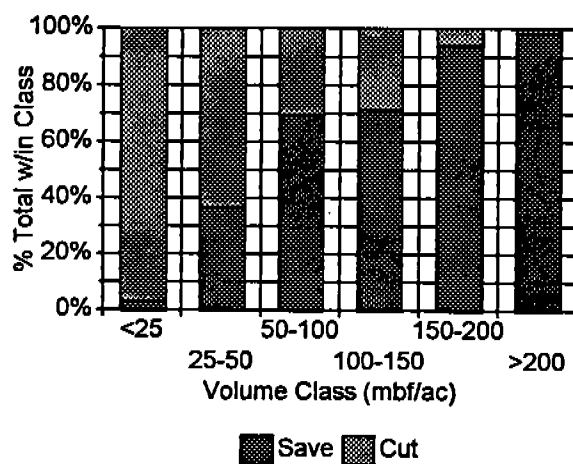


Figure 5. Percentage of the suitable redwood old-growth habitat within each volume class proposed for harvest or conservation, respectively.

The proposed action will preserve acres with large amounts of volume and focuses harvest in acreage that has relatively low volume density. Assuming that per acre volume and large trees per acre are positively correlated with nest platform density, this approach would conserve the areas with the most nesting opportunities for murrelets and the areas likely to have the highest density of breeding murrelets and the highest relative nest success (Swartzman et al. 1997, page13).

According to PALCO, the harvest methods that resulted in today's ROG stands removed the largest trees with the most timber volume, and left smaller trees with more likelihood of future growth. The smaller trees left unharvested (which are often large trees by most standards) sometimes have fewer of the large limbs and deformities that murrelets use for nesting (see notes from SYP/HCP Scientific Panel May 26 and 27, 1998; in Volume IV, Part B, Section 7, in Draft SYP/HCP, although no quantitative data were provided to the FWS on this issue). Thus, with fewer trees per acre and fewer nest structures per tree, ROG stands probably have fewer nesting opportunities than UOG stands (S. K. Nelson, pers. comm., November 12, 1998). There may be some site specific exceptions to this conclusion (i.e., some low volume stands may have some individual trees with many platforms, while some high volume stands may have some large trees with low numbers of nest platforms), but as a general rule the FWS believes that the high volume acres likely contain significantly higher quality murrelet habitat.

Canopy closure and second growth subcanopy in harvested and conserved stands: Using data provided on ROG in table N.1-3 of Appendix N1 of the Final EIS/EIR, as updated by T. Reid (pers. comm., February 5, 1998), figure 6 illustrates how much ROG and UOG habitat will be either harvested or protected in six different categories of canopy closure and height of second-growth. Canopy closure and height of second-growth were each divided into three relative categories of low (L), medium (M), and high (H). These ratings were combined for the two measures and were applied to harvest or protected areas.

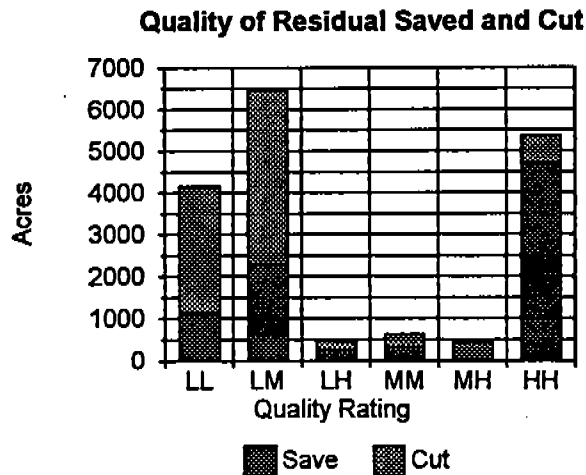


Figure 6. ROG and UOG habitat acres that will be either harvested or protected in six relative categories of canopy closure and height of second-growth, with these two measures combined as done in table N1-3 of the Final EIS/EIR. L = low quality, M = medium quality, H = high quality. (Data from T. Reid, table 7E, February 5, 1999).

The most important conclusion from this figure is that most of the area proposed for harvest is from areas with relatively low or moderate vertical cover (i.e., second-growth height) and canopy closure, while most habitat reserved has high canopy closure and vertical cover. However, the figure indicates that about 1,000 acres of ROG or UOG with moderate or high canopy closure and vertical cover that will be harvested; these areas are good quality murrelet habitat, and their removal will adversely affecting nesting murrelets.

The FWS concludes the proposed action would succeed reasonably well in focusing harvest in the ROG stands with lower canopy closure, while conserving the most UOG and some ROG areas that have the highest canopy closure and some of the tallest understory trees (see also Marbled Murrelet Recovery Team, November 30, 1998). Although the direct relationship between canopy closure and nest success is not yet known, these conserved areas with greater canopy closure are likely to have greater nest success than areas with lower canopy closure due to reduced predation and greater protection from adverse weather (Swartzman et al. 1997, page 14; Hamer 1995, page 174; Hamer and Nelson 1995, page 80; Nelson and Hamer 1995b, pages 91 and 96). It is expected that most of these second-growth trees will grow tall enough during the permit period to enhance the value of remaining old-growth redwoods and increase murrelet nest success within these stands (see Appendix 1). The condition of second-growth within residual stands is important where residual stands are found near occupied old-growth stands because the old-growth stands could provide the source of murrelets for re-occupation of the improving residual

habitat (Divoky and Horton 1995, Swartzman et al. 1997, page 52). Residual stands with well-developed second-growth that neighbor old-growth stands offer the highest available potential for habitat improvement within the life of the SYP/HCP (Marbled Murrelet Recovery Team, November 30, 1998). Therefore, in evaluating potential future habitat, the agencies regard residual stands near occupied old-growth as more valuable than residual stands that are isolated from old-growth stands.

Relative stand size between harvested and conserved areas: Landscape analysis conducted by the FWS found there are 427 identifiable old-growth stands on PALCO lands (including the Headwaters acquisition area). Almost 50 percent are less than 5 acres in size, and about 88 percent are less than 50 acres in size. Thirteen stands are greater than 300 acres, with nine proposed for conservation and four proposed for harvest. To adequately assess if the proposed action conserves the larger and potentially higher quality stands, we compared the size and quality of the largest "named" redwood stands in the harvest and conservation categories, respectively (figures 7, 8, 9, and 10).

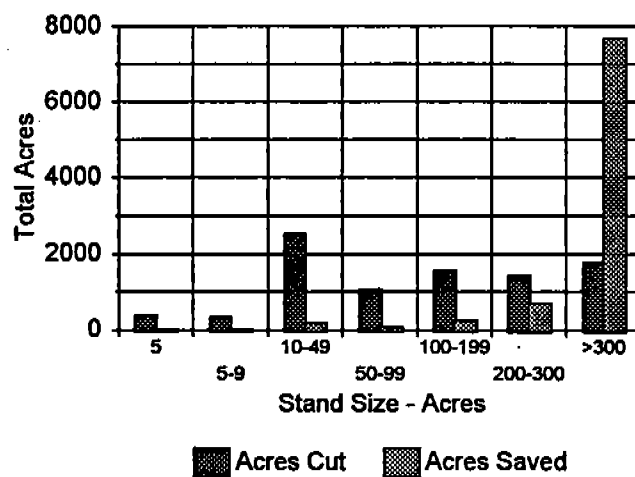


Figure 7. Acres proposed for harvest and acres conserved in stands of various sizes, UOG and ROG combined.

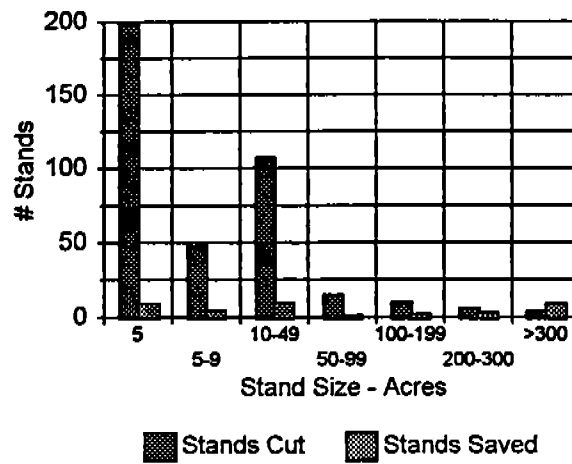


Figure 8. Total number of stands of various stand size proposed for harvest and conservation, UOG and ROG combined.

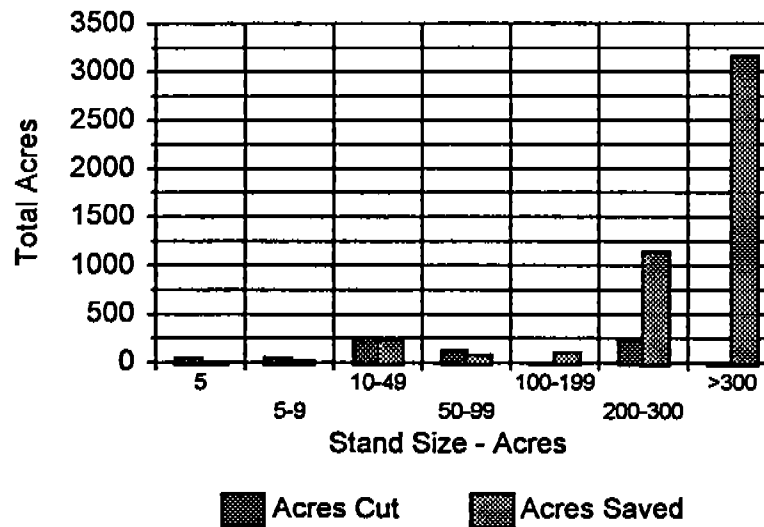


Figure 9. Acres proposed for harvest and acres conserved in stands of various sizes, UOG only.

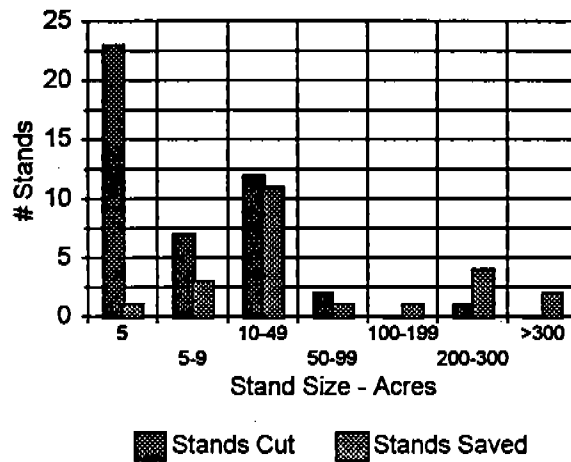


Figure 10. Total number of stands of various stand size proposed for harvest and conserved, UOG stands only.

High degrees of fragmentation and isolation from old-growth are evident in visual examination of the distribution of most of the residual stands that would be harvested (see Final EIS/EIR map at figure 3.9-2). Many of these small stands, especially the 260 stands under 10 acres in size, are likely to have little or no current value for murrelets due to high amounts of edge (assuming most are not currently adequately buffered with older second-growth).

In contrast, a few of these ROG stands are relatively large. Approximately 2,040 acres, or about 25 percent of the ROG available for harvest, are in six stands of over 200 acres each. Observations of murrelet occupied behavior have occurred in three of these stands, although the rates of occupied detections in these stands have been much lower than those observed in typical UOG (Ralph et al. 1998; see Volume IV, Part B, Section 10 in Draft SYP/HCP); these three stands are in the Grizzly Creek area, the lower Jordan Creek area, and the upper portion of the North Fork Elk River watershed (a.k.a. Turkey Foot).

At approximately 566 acres, the Turkey Foot stand is the largest contiguous ROG stand that is proposed for harvest. Aerial photography and GIS analysis indicate this stand is characterized by a fragmented, linear configuration with high amounts of edge and an open forest with low canopy closure. It also has a low volume density (approximately 30 mmbf per acre; T. Reid, pers. comm.), suggesting it has relatively low numbers of nest platforms and canopy closure when compared to UOG stands. It is the only one of the six that is within designated critical habitat.

The remaining three of the largest six ROG stands in the harvest category have not been adequately surveyed for murrelets. One is in the upper portion of the Jordan Creek drainage (412 acres); site visits to this stand have determined that it is not considered suitable murrelet nesting habitat. The second stand (205 acres) is in an isolated parcel up the Eel River over 10 miles from the remainder of the ownership, and the third is in the lower Bear Creek drainage (244 acres).

Other areas of ROG available for harvest that may have some medium or high value for murrelets include two areas of mixed stands that are contiguous with occupied residual in MMCAs. These two areas (one of about 110 acres and one of about 160 acres) are adjacent to the "Below Road 7 and 9" MMCA stands (see Map 4 in Volume IV, Part B, Section 12, in Draft SYP/HCP). In this area, unlike most other MMCAs and the Headwaters, the proposed action will place contiguous habitat outside the reserves. Murrelets have been detected in these areas without observations of occupied behavior, but the stands have not been surveyed adequately to conclude that they are unoccupied. Most of the area in these two stands proposed for harvest have canopy closures of 25 to 50 percent, which is relatively high within the ROG type. Both are within designated critical habitat. Because of their location and relatively good quality, these trees might represent the most valuable residual available for harvest and probably constitute the most significant short-term impact to the species.

The FWS concludes that the proposed action would protect most of the largest discrete stands of UOG and ROG that likely contain the best murrelet habitat, while releasing for harvest the relatively smaller stands of ROG and some small stands of UOG. Although there are a few relatively large stands that would be released for harvest (e.g., Turkey Foot), the proposed action protects the largest stands of the highest quality, especially within the UOG habitat type.

Summary of relative habitat quality between harvested and protected areas: Based on interpretations of murrelet surveys, habitat data for each of these habitat types, and the scientific literature regarding habitat quality, the FWS concludes the proposed action effectively focuses conservation in areas that are likely to have the greatest current value for marbled murrelets, while releasing for harvest a large amount of habitat that is of relatively low to moderate value to murrelets. The proposed action would be reasonably successful at protecting the highest quality habitats and much of the moderate quality habitats (Marbled Murrelet Recovery Team, November 30, 1998; P. Karieva, December 7, 1998), while targeting most (but not all) harvest to the lower quality habitats. However, some of these released ROG stands, while relatively low quality today, represent potentially valuable recovery habitat if their condition was allowed to improve over longer time periods. It is anticipated that this impact will to some extent be offset by the development of improved habitat conditions in the MMCAs and in the Headwaters acquisition area.

To summarize, UOG redwood conserved in MMCAs and in the Headwaters acquisition area likely provides more nesting opportunities and higher rates of reproductive success per acre than does the ROG habitat proposed for harvest for the following reasons:

1. Habitat types with greater occupancy rates are probably more valuable to the species than habitat types with lower occupancy rates (Ralph et al. 1995);
2. Habitat with greater volume densities likely has, on average, more nesting and hiding opportunities and higher reproductive success rates (Swartzman et al. 1997, page 13; Hamer and Nelson 1995, page 80);
3. Modified forests may have higher predator populations or predation rates than unmodified old-growth forests (Ralph et al. 1995, page 7; Nelson and Hamer 1995a, page 67);
4. Microclimate conditions and protection from adverse weather conditions are likely to be better in denser old-growth stands with greater horizontal and vertical canopy closure (Ralph et al. 1995, page 7; Hamer and Nelson 1995, page 80);
5. Larger, contiguous stands with less edge are likely to have lower rates of predation than smaller, open stands with more edge (Ralph et al. 1995, page 15; Hamer and Nelson 1995, page 80; Swartzman et al. 1997, page 18).

Adverse Effects of the Proposed Final SYP/HCP

The preceding analysis enabled (1) the quantification of suitable and occupied habitat that will be removed and conserved, and (2) an evaluation of the relative value of the habitat areas that will be removed or conserved. Using this information, this section will assess the adverse effects of the proposed timber harvest on the species. The goal of this assessment is twofold:

Describe and quantify, to the great possible extent, the actual impact of the proposed action on the murrelets in the action area; and

Analyze and determine whether these impacts would appreciably reduce the likelihood of the listed species' long term survival and recovery.

The anticipated adverse impacts of the proposed action include:

1. An overall reduction in the total amount of suitable and occupied nesting habitat on PALCO lands, with most loss occurring in the first 10 years of the SYP/HCP;
2. Displacement of direct mortality of nesting murrelets due to harvest of occupied habitat, resulting in a reduced number of breeding murrelets on PALCO lands for an indeterminate time period;
3. Indirect adverse effects to nesting murrelets due to nest disturbance, potentially resulting in some small reduction in reproductive success;

4. Indirect adverse effects to nesting murrelets due to forest fragmentation on some portions of PALCO lands, resulting in potential increases in predation and negative microclimate conditions; these impacts should be minimized or eliminated in many areas due to the buffering of reserve stands; and
5. Indirect long-term adverse effects due to the loss of suitable habitat that will not be recruited to occupied status and will not contribute to recovery.

Overview of Adverse Effects Associated with Timber Harvest: The murrelet was listed due mainly to the loss of suitable nesting habitat throughout its range in the Pacific Northwest. The effects of habitat modification activities on murrelet habitat depend upon the silvicultural prescriptions used and the location of the harvest related to suitable habitat. Impacts may include a complete loss of habitat, a degradation of habitat, or harvest of unsuitable habitat adjacent to and contiguous with suitable habitat. Removal of murrelet habitat and other harvest prescriptions that result in even-aged, monotypic forests produce unsuitable murrelet habitat; silvicultural prescriptions that promote multi-aged and multi-storied stands may in some cases retain suitability for murrelets and perhaps increase the quality of habitat over time.

Considerable evidence links the declining numbers of murrelets to the removal and degradation of available suitable nesting habitat (Ralph et al. 1995). The removal of suitable habitat likely to occur during the implementation of a proposed action can potentially adversely affect the murrelet population in several ways. These effects include:

- ☐ The immediate displacement of birds from traditional nesting areas;
- ☐ The concentration of displaced birds into smaller, fragmented areas of suitable nesting habitat that may already be occupied;
- ☐ Increased competition for suitable nest sites;
- ☐ Decreased potential for survival of remaining murrelets and offspring due to increased predation;
- ☐ Diminished reproductive success for nesting pairs;
- ☐ Diminished population due to declines in productivity and recruitment; and
- ☐ Reduction of future nesting opportunities.

Murrelets have few defenses from predation, and the ability to remain concealed is essential for successful reproduction. Continued fragmentation of habitat may result in increases in exposed forest edges and the displacement of murrelets to already-occupied habitat. The increased

murrelet densities and exposure to edges in remnant nesting habitat may make birds more susceptible to predation. Predation by corvids and raptors is a known cause of murrelet nest failure. From 1974 through 1993, 57 percent of known nest failures were due to predation, with corvids suspected as the major predator (Nelson and Hamer 1995a). Corvids are typically "edge species" that increase with increased forest fragmentation or decreased distance of nests from a forest edge (Gates and Gysel 1978, Andren et al. 1985, Small and Hunter 1988, Yahner and Scott 1988). Nelson and Hamer (1995a) found that successful marbled murrelet nests were significantly further from forest edge than unsuccessful nests, and cover directly around the nest was significantly greater at successful nests. Preliminary results from a study using simulated murrelet nests (Marzluff et al. 1996) indicate that proximity to human activity and landscape contiguity may interact to determine rate of predation. Interior forest nest stands far from human activity appear to experience the least predation. Although the exact relationship between forest fragmentation, predation, and marbled murrelet nesting success has not been specifically demonstrated through an intensive study, the best available information strongly suggests that reproductive success may be adversely affected by forest fragmentation associated with certain land management practices (USDI Fish and Wildlife Service 1997).

It is likely but unknown if individual murrelets return to the same nest sites or forest stands in consecutive years. Most species of alcids exhibit high nest site fidelity (Nettleship and Birkhead 1985, Gaston 1992), as do many other species of birds nesting under a variety of environmental conditions. The prevalence of this trait in so many bird species strongly suggests that the behavior confers distinct survival advantages. Occupation of traditional nesting sites over many generations is common in species that display strong nest site fidelity (Ehrlich et al. 1988), and murrelet nesting sites appear to be traditionally used. Observations of nest sites have shown that individual nest trees are used in consecutive years, but it is unknown if these trees are used by the same individual birds in successive years. The potential for colonization of new nesting sites, assuming adequate suitable habitat is available, is not known. Significant loss of occupied nesting habitat is likely to hamper efforts to stabilize the population and to recover the species (Ralph et al. 1995), and the Recovery Plan (USDI Fish and Wildlife Service 1997) emphasizes preventing the loss of occupied nesting habitat as a means to assist in the recovery of the murrelet.

Harvest of Occupied Nesting Habitat in the Proposed Action: Using the information described above and from the Environmental Baseline, the FWS estimates that the proposed action will result in the harvest of 15,212 acres of potentially suitable murrelet habitat. Of this amount, there are 2,222 acres of known occupied habitat and 2,476 acres of unsurveyed but likely occupied habitat. In total, approximately 4,696 acres of known or potential occupied habitat will be harvested or otherwise impacted, or about 35 percent of the likely occupied habitat on PALCO lands (including the Headwaters acquisition area). This loss of habitat will have direct and indirect adverse effects to the species.

To further refine this impact by habitat type, implementation of the proposed action would result in the harvest and permanent loss of 446 acres of occupied high-quality UOG habitat, 4,013 acres of occupied low to moderate quality ROG habitat, and 237 acres of occupied low quality DFOG

habitat. The removal and fragmentation of this habitat would result in the take of an unknown number of murrelets associated with this habitat.

The proposed harvest acreage is approximately 21.7 percent of the likely occupied habitat in the Bioregion, 3.6 percent of the likely occupied habitat in Marbled Murrelet Conservation Zone 4, and 0.67 percent of the likely occupied habitat in the three-state listed range (range) (table 56).

Table 56. Percentage of the total estimated amounts of likely occupied habitat at the PALCO lands, Bioregion, marbled murrelet conservation zone 4, and three-state listed range scales, respectively, that will be lost due the proposed harvest of 4,696 acres of known or likely occupied habitat. Data from table 13, Environmental Baseline section.

	PALCO Lands (inc. Headwaters)	Southern Humboldt Bioregion	Conservation Zone 4	Three-State Listed Range
Estimated Total Acres Likely Occupied	13,526 ¹	21,693	130,638	702,335
SYP/HCP Harvest of Occupied Habitat as Percentage	34.6% ²	21.7%	3.6%	0.67%

¹ Unknown how much of unsurveyed ROG is >15 OG trees/ac and where it occurs. Assumed 95-100% unsurveyed residual is <15 OG trees/ac. and used 0.52 occupancy rate for both harvest and no harvest calculation. Therefore, to be more conservative from the species' perspective, the total estimated here is 32 acres less than the total estimated in Environmental Baseline.

² NOTE: This estimate of percentage occupied acres harvested does not correct for the potentially occupied habitat that is protected within riparian management zones (RMZs) but outside of reserves; if likely occupied riparian reserve UOG, ROG, and DFOG acreage are subtracted from the occupied habitat harvest total, the percentage of likely occupied habitat that is released for unencumbered harvest is reduced to 23.5% on the ownership, 14.7% in the Bioregion, 2.4% in conservation zone 4, and 0.45% in the listed range (O. Rand, pers. comm., February 4, 1999).

The FWS believes that the largest impact to the species as a consequence of this harvest will be the physical displacement of the resident birds and the likely loss of subsequent reproductive output from most of these individuals and their offspring. Harvest of UOG and ROG will result in permanent loss of an unknown number of sites used for nesting, which would require affected murrelets to nest elsewhere or abandon nesting behavior. Some percentage of displaced adult and immature birds may be able to find other habitat where they can breed successfully in subsequent years, thereby reducing the effect of harvest (Kress and Nettleship 1988, Divoky and Horton 1995, page 87). The FWS believes that the likelihood of this occurring is low for most displaced murrelets. We therefore assume that most (but not all) of these birds are effectively removed

from the breeding population, thereby reducing the total number of murrelets on PALCO lands at least for the early portion and perhaps most of the permit period.

Potential for Direct Mortality: PALCO proposes to harvest some potentially occupied or unsurveyed marbled murrelet habitat during the breeding season but states that if nests are found in stands available for harvest, they would be protected until after the breeding season. The Service believes that lack of pre-project surveys and the difficulty of finding nests renders this proposed mitigation of little conservation value. However, the SYP/HCP will substantially minimize this potential take by precluding harvest in all known occupied stands and in half of the unsurveyed stands. The designation of unsurveyed stands in which to defer harvest during the breeding season will be based on a ranking of habitat features such as canopy closure, stand size, and potential nest platform density. Stands that rank in the upper 50 percent of this group will not be harvested during the nesting season, while those stands that rank in the lower half can be harvested during the nesting season. There are approximately 4,320 acres of unsurveyed suitable ROG proposed for harvest. Under the proposed rating scheme approximately 2,160 acres would be available for harvest during the nesting season. Of this total, approximately 1,123 acres are anticipated to be occupied, using the 0.52 occupancy rate. Harvest during the breeding season in this lower quality habitat would probably result in some mortality of eggs and flightless young, but most adults would probably escape.

Loss of Suitable Unoccupied Habitat: In addition to the loss of occupied habitat and the associated take of murrelets through displacement or a small amount of direct mortality, the proposed action will adversely affect the species by removing a large amount of currently suitable but unoccupied habitat. Although direct take will generally not occur with the harvest of this habitat, its removal could adversely affect the recovery of the species (USDI Fish and Wildlife Service 1997) in two general ways: (1) additional fragmentation of the surrounding landscape, opening up gaps where predators and adverse weather conditions can negatively affect the remaining suitable habitat, and (2) loss of recruitment habitat for future murrelets to colonize and occupy. Some of this habitat, if allowed to remain on the landscape, would likely have been colonized by dispersing murrelets as its quality improved with time and as the population begins to stabilize and recover. It is expected that second growth and residual redwood recruitment habitat that will develop or improve in the MMCAs and in the Headwaters area will to some extent offset this loss and is discussed later in this opinion. Most of the Headwaters acquisition area, the MMCAs, and State Park boundaries are buffered with over 2,100 acres of forested habitat; this buffer habitat consists of existing residual old-growth (14 percent), late-seral (23 percent), mid-seral (50 percent), or early seral (13 percent) forest. These buffers should minimize adverse effects due to potential fragmentation (See discussion in Appendix N2, Final EIS/EIR; Marbled Murrelet Recovery Team, November 30, 1998).

Forests with older residual trees remaining from previous forest stands may develop into nesting habitat more quickly than those without residual trees (USDI Fish and Wildlife Service 1996a). Stands with residual old-growth trees, even if unoccupied, have value to the marbled murrelet as recruitment habitat. Re-growth of the understory in these stands could in a relatively short time

provide protective cover to the remaining potential nest trees. This habitat can become high quality murrelet nesting habitat much faster than unsuitable areas that lack potential nest trees. Forests typically require 200 to 250 years to attain characteristics necessary to support nesting marbled murrelets, although these conditions may develop in coastal redwood forests (USDI Fish and Wildlife Service 1996a).

Disturbance Effects: The SYP/HCP outlines a process to minimize to the greatest extent feasible the potential adverse effects to nesting murrelets from noise disturbance. This process includes standard measures for reducing the likelihood of disturbance wherever feasible, but because other management needs may influence the degree of its application, the actual degree of effectiveness cannot be accurately predicted. The FWS believes that the proposed action will result in some disturbance of nesting marbled murrelets, although information is not available to quantify the exact number of murrelets that might be taken.

Noises associated with various activities proposed in the SYP/HCP could disturb nesting murrelets in adjacent, occupied habitat. Murrelets may be relatively sensitive to disturbance due to their secretive nature and their vulnerability to predation, but some birds appear to habituate to regular disturbances along existing roads and near campgrounds. Preliminary research has found that human disturbance caused adult murrelets to abort feeding visits to the nest, while hatchlings appear relatively tolerant of many disturbance stimuli (Nelson et al. 1998). Other than this preliminary work, there is little detailed information concerning the vulnerability of murrelets to disturbance effects, research on a variety of other bird species suggest that such effects are possible (Henson and Grant 1991, Reijnen et al. 1995, Rodgers and Smith 1995). Such studies have shown that disturbance can affect productivity in a number of ways: nest abandonment; egg and hatchling mortality due to exposure and predation; longer periods of incubation; premature fledgling or nest evacuation; depressed feeding rates of adults and offspring; reduced body mass or slower growth of nestlings; and avoidance of otherwise suitable habitat.

Due to the significant lack of disturbance-related information on murrelets, coupled with the studies mentioned above, it can be assumed that disturbance could result in some negative impacts. However, it is expected that these negative impacts are relatively minor compared to the impacts due to the loss of suitable habitat. In sum, activities occurring on or near up to 13,588 acres of potential occupied marbled murrelet habitat could adversely affect nesting murrelets through disturbance effects.

Summary of Adverse Effects: Approximately 15,213 acres of potentially suitable habitat is proposed for harvest². Of this harvest total, 8,303 acres is unoccupied Douglas-fir habitat expected to be of little to no value to the murrelet, and approximately 4,496 acres is known or likely to be occupied habitat that is of low to high quality. In contrast, approximately 9,056 acres of mostly high quality redwood old-growth will receive protection in permanent acquisitions or as

² This estimate of total harvested acres does not correct for the approximately 4,775 acres of unentered old-growth and residual forest within riparian management zones (RMZs) but outside of reserves.

MMCA's for the 50 year permit period. In terms of area, this harvest represents about 35 percent of the total occupied habitat on PALCO lands, 21.7 percent of the Bioregion, 3.6 percent of Zone 4, and 0.67 percent of the listed range.

The removal of this amount of occupied murrelet habitat in the short-term (5 to 10 years) is a serious adverse effect to the species, especially if this impact occurs before benefits begin to accrue for murrelets in the protected areas. If one assumes homogeneous distribution of murrelets in all occupied habitats, one might conclude that removal of 21.7 percent of the Bioregional habitat impacts 21.7 percent of the murrelets nesting in the Bioregion. But such an assumption is not justified, and the percentage of murrelets in the Bioregion impacted by the proposed SYP/HCP is likely to be lower than 21.7 percent.

Most of the occupied acres proposed for harvest are moderate to lower quality murrelet habitat relative to the conserved UOG stands. The ROG and DFOG stands probably have lower murrelet nesting densities and lower rates of reproductive success than most of the protected reserves and the high quality habitat in portions of neighboring state parks (Swartzman et al. 1997). The harvest stands are smaller, more fragmented, and have lower canopy closures. Therefore, it is probable that the total number of murrelets actually impacted by the proposed action is smaller than the proportion suggested by the acres that will be removed as a percentage of occupied habitat within the Bioregion.

Also, as discussed in the Environmental Baseline, calculations of occupied habitat in the Bioregion may underestimate the amount of occupied habitat in HRSP, thereby overestimating the relative impact of the proposed harvest of occupied habitat within the Bioregion. This possibility, in conjunction with the likelihood that murrelets are occupying the proposed harvest areas in lower densities compared to the high quality reserve areas, leads to the conclusion that the number of murrelets impacted is probably significantly less than 21.7 percent of the birds within the Bioregion. However, the FWS has no reliable quantitative data or method to calculate such a figure and can only conclude with some confidence that the number is likely smaller than indicated by the occupied area estimates.

A goal of this proposed action was to develop a strategy that conserved enough high quality murrelet nesting habitat -- and in sufficient amounts, configuration, and distribution -- to maintain a viable population on PALCO lands (including the Headwaters acquisition area), in the Bioregion, and in Recovery Zone 4, while allowing harvest in habitat whose loss was not likely to jeopardize the species. Although the total number of murrelets on PALCO lands will likely be reduced as a consequence of this habitat removal, the proposed action protects a significant majority of the most important murrelet habitat on the ownership and, therefore, a majority of murrelets (P. Karieva, December 7, 1998). Over 91 percent of the most valuable unentered old-growth is retained, and approximately 50 percent of the occupied residual old-growth is also retained, much of which is the higher quality habitat within the ROG class as measured by stand size, canopy, and volume density. In addition, the proposed action retains the largest stands and targets harvest to the smaller stands. Successful reproduction in ROG stands is likely to occur at

a lower rate than successful reproduction in UOG stands (Swartzman et al. 1997), and reproduction in small UOG redwood stands with high ratios of edge to interior is also likely to be lower than in larger stands of UOG redwood.

Some biologists and scientists involved in the development or review of the SYP/HCP and Headwaters purchase have suggested that low quality habitat could constitute murrelet "sinks" where populations consistently fail to replace themselves, while high quality areas may be "sources" of dispersing individuals to these sinks (See SYP/HCP Scientific Panel notes for June 12 and 13, 1998; Volume IV, Part B, Section 7, in Draft SYP/HCP; D. Murphy, September 10, 1997; P. Karieva, December 7, 1998). Sources are areas where local reproductive success is greater than local mortality, while sinks are areas where local productivity is less than local mortality. In the absence of immigration from source areas, populations in sink habitats decline toward extinction (National Research Council 1995, page 98).

The National Research Council (1995, page 97) recommends that conservation planning for endangered species incorporate this concept of source and sink habitats. However, identifying which habitats are sources and which are sinks can be difficult if basic information on the species of concern is limited (National Research Council 1995, page 103), and the FWS believes that there is little reliable information to conclusively determine if some habitats on PALCO lands truly are murrelet "sinks" while others are murrelet "sources." But even if such information is lacking or limited, basic "conservation strategies can be formulated without detailed estimates of needed details of organisms' biology," and "consideration of source-sink dynamics is an important aspect of reserve design and habitat protection" (National Research Council 1995, page 103).

Therefore, the FWS believes the source-sink concept has merit as a general guide in helping design an HCP that protects as much likely source habitat as possible, while focusing the applicant's harvest in areas that are more likely to be sink habitat (National Research Council 1995; Karieva, December 7, 1998; D. Murphy, September 10, 1997). Given the small stand size, low volume density, and lower canopy closure for much of the ROG proposed for harvest, it is likely that most of this ROG habitat contains lower densities of murrelets which are experiencing relatively low rates of reproductive success. It is acknowledged that these ROG stands likely experience greater predation rates than the UOG stands (Swartzman et al. 1997, page 18).

If any stands on PALCO lands are murrelet sinks, it is likely to be some of these ROG stands that are moderate to low quality, especially if predation rates are high for breeding adults and not just eggs or hatchlings. However, the FWS still places an overall premium on all occupied murrelet habitat, as described in the Marbled Murrelet Recovery Plan (USFWS 1997, page 139) and previous murrelet biological opinions, and loss of these sites is an impact to recovery. The MMCA strategy is not an attempt to proactively remove potential sink habitat, although some members of the PALCO scientific panel and other consultants (D. Murphy, pers. comm., September 22, 1997) suggested such an approach was worthy of consideration. Rather, the combination of the MMCA and Headwaters reserve is an attempt to strategically reduce the

impact of harvest on the species in such a way that enough of the highest quality habitat is conserved to ensure the species' short-term and long-term viability.

Beneficial Effects of the Proposed SYP/HCP

The preceding analysis enabled the assessment of the adverse effects of the proposed SYP/HCP on the marbled murrelet. This section evaluates the likely beneficial effects of the proposed SYP/HCP. The anticipated beneficial effects include:

1. A net increase in the total amount of suitable habitat and the overall quality of nesting habitat in the acquired Headwaters reserve complex;
2. A net increase in higher quality nesting habitat and potentially suitable habitat in MMCA reserves by the end of the 50-year term of the SYP/HCP;
3. An increase in murrelet nesting densities and improved reproductive success rates in the Headwaters complex and the MMCA reserves that should fully or partially offset the loss of nesting habitat by the end of the 50-year term of the SYP/HCP; and
4. In addition to the permanent or 50-year protection of 9,056 acres of suitable and mostly occupied habitat, the additional full or partial retention of up to 4,775 acres of old-growth redwood and Douglas-fir in riparian reserves; retention of this riparian old-growth will preserve some future management options for further murrelet conservation if needed.

The total area protected within MMCAs and the Headwaters acquisition is 18,759 acres (O. Rand, pers. comm., February 4, 1999). Of this total, approximately 4,694 acres is unentered redwood old-growth, 4,429 acres is residual redwood old-growth, and 216 acres is Douglas-fir old-growth. The remaining habitat is not old-growth: 2,535 acres of late-seral forest (>24 inches dbh); 3,004 acres of mid-seral forest (12 to 24 inches dbh), 3,473 acres of young seral (<12 inches dbh), and other (table 57).

Over time the Headwaters reserve and MMCAs will improve in several ways that should provide some additional benefits to murrelets:

1. Understory within existing residual old-growth will continue to grow and provide better vertical and horizontal cover for nesting murrelets. This development should increase the density of nesting opportunities and reproductive success within a stand by making more potential platforms usable with better cover.
2. Forest areas that are contiguous with existing nesting habitat but that do not contain large trees with potential nest platforms will continue to grow. The late- and mid-seral forests existing today are currently providing some buffering

function to these adjacent areas. At the stand level, this performance will improve with time, as will recruitment of buffers in what is currently young seral.

3. At the landscape level, as these young, mid-, and late-seral forests continue to grow, many of them will "block up" smaller scattered residual and unentered old-growth patches into a larger contiguous stand that overall will have less total edge habitat and may provide less opportunities for some murrelet predators.

The importance of stand size and canopy and vertical cover to murrelet reproductive success is discussed in the Environmental Baseline and earlier portions of this Effects of the Action section. The following discussion is based on the assumptions and scientific literature cited in those sections.

Although detailed site specific information was not provided to the FWS, it can be assumed that much of the late-seral area in the reserves includes trees greater than 24 inches dbh, and much of the mid-seral area includes trees between 11 and 24 inches dbh. According to data supplied by Vestra and PALCO and analyzed by the FWS (Appendix 2), in general most trees that are greater than 24 inches dbh are already at or very near the height where they should begin providing horizontal and vertical cover to nesting platforms in the lower portions of old-growth trees (approximately 120 feet (Nelson and Hamer 1995b)). As these understory trees grow up in height alongside existing residual old-growth or on the edges of unentered stands, they will continue to "capture" more nest platforms and provide these platforms with cover; Appendix B shows the relationship between tree dbh and height for the SYP/HCP area. This cover should make more nest platforms available to prospecting murrelets (assuming prospecting murrelets use some consideration of cover as a nest site selection criterion), and it should increase the reproductive success of murrelets by decreasing predation and providing cover from adverse weather.

Table 57. Estimates of acreage by habitat type in stands associated with the acquired Headwaters reserve and the MMCA reserves.

Reserve	Uncut DF OG	Residual DF OG	Uncut Red OG	Residual Red OG	Late-seral	Mid-seral	Young Seral	Other Seral	Total
Headwaters	0	0	3117	666	1,521	625	1438	135	7502
Allen Creek	0	0	393	595	150	445	37	109	1729
B Rd 7&9	0	0	21	239	14	98	100	20	492
Bell Lawrence	0	0	339	107	0	23	162	1	633
Booths Run	158	8	0	216	0	78	324	0	784
Cooper Mill	0	0	0	397	16	135	155	0	703
Elkhead Residual	0	0	0	64	0	0	285	0	349
Grizzly Creek	0	0	131	738	104	317	34	82	1406
LNF Elk	0	0	0	237	159	46	9	0	451
Owl Creek	13	6	359	334	45	31	385	22	1195
Road 3	0	0	0	375	38	110	0	40	564
Rt Rd 9	0	0	78	112	0	0	128	0	318
Shaw Gift	31	0	255	55	0	32	130	0	503
Buffers	0	0	0	294	488	1064	285	0	2131
Total	202	13	4693	4429	2535	3003	3473	408	18759

Of the 4,136 acres of residual redwood in the reserves, approximately 1,574 acres (38 percent) have a late-seral or mid-seral understory over 60 feet tall. Some of this late-seral understory is already functioning to provide some cover to nest platforms. This function will increase during the next 50 years as trees grow between another 30 to 90 feet in height (specific growth rates depend on site location). On average, late-seral understory trees should be between 140 and 200 feet at the end of the 50 year permit period. Likewise, with the next 50 years most of the mid-seral age class will have achieved and surpassed, on average, the 120-foot mark where they begin providing cover to nesting platforms in residual old-growth trees (Appendix 2). Approximately 2,562 acres (62 percent) of residuals in reserves have a young to mid-seral understory less than 60 feet in height. Although some of these trees may reach 120 feet in 50 years, most will not provide much improvement for murrelets within the 50-year permit period. These stands will, however, be well positioned to provide future benefits to the murrelet beyond 50 years.

In addition to recruitment of understory cover within the residual old-growth, overall habitat quality should improve due to increases in tree height outside but contiguous to the unentered and residual stands (USDI Fish and Wildlife Service 1997, page 142-144). These improvements will occur at both the stand and the landscape levels. As Figure 3.9.2 in the Final EIS/EIR indicates, much of the old-growth habitat in reserves is scattered and fragmented with high amounts of edge; some of this is due to natural site condition variability, but much of it is a consequence of past timber harvest. Mid-seral and late-seral trees around the old-growth will improve buffering capability. These stands will fill in many of the gaps between residual or old-growth and effectively "block up" some disjunct occupied habitat patches into larger contiguous late-seral stands. Where old-growth borders young seral stands, over the 50 years these hard forest edges should "soften" as they become mid-seral; although these young stands will not provide cover to nest platforms higher in the overstory, they will provide some protection from windthrow and fire (USDI Fish and Wildlife Service 1997, page 143).

The Marbled Murrelet Recovery Plan (USDI Fish and Wildlife Service 1997) describes the importance of using the HCP process to protect murrelet habitat on private lands for long periods of time. Take prohibitions under section 9 of the ESA primarily protect murrelet habitat that is currently occupied. As the murrelet population declines some of this habitat will become unoccupied, eventually resulting in a lapse of restrictions on the harvest of this habitat and allowing a continuing erosion of habitat needed to eventually recover the species (USDI Fish and Wildlife Service 1997, page 133). Therefore, "Habitat Conservation Plans with appropriate measures to minimize and mitigate incidental take in the short-term while providing for maintenance or creation of habitat for the long term probably offer the best means for conservation of the species on non-Federal lands" (USDI Fish and Wildlife Service 1997, page 133).

In sum, at the end of 50 years the murrelet nesting opportunities and reproductive success in the combined 18,759 acres of the Headwaters reserve and the MMCAs are expected to improve in the following ways: (1) more nesting platforms will be positively affected by increased levels of vertical and horizontal cover in the unentered and residual old-growth; (2) buffers around

individual old-growth stands will increase in tree height, increasing the size of individual stands and creating more interior forest conditions for existing old-growth trees, in turn making nesting murrelets less vulnerable to predation and adverse weather (USDI Fish and Wildlife Service 1997, page 143; Swartzman et al. 1997, page 18); and (3) at the landscape level, patches of old-growth will be "blocked up" into contiguous, larger stands that have less total amounts of edge and that will be more likely to maintain interior forest conditions. This combination of permanent and long-term habitat protections will benefit the murrelet.

Marbled murrelet critical habitat

The standard for evaluation of effects to critical habitat under section 7 of the Act is whether the proposed action is likely to result in destruction or adverse modification of critical habitat for the species. Destruction or adverse modification of critical habitat is defined at 50 CFR 402 as "direct or indirect alteration that appreciably diminishes the value of critical habitat for both the survival and recovery of a listed species. Such alterations include, but are not limited to, alterations adversely modifying any of those physical or biological features that were the basis for determining the habitat to be critical." Further, the Final Rule designating critical habitat for the marbled murrelet states " [the basis for an adverse modification opinion would be whether a proposed action appreciably reduces the ability of critical habitat to function in achieving the regional conservation zone goals. In evaluating the effect of a proposed action, the Service will analyze the impacts to individual units in light of their overall contribution to the survival and recovery of murrelets in the conservation zone....and the overall range of the marbled murrelet in Washington, Oregon, and California. Thus an adverse modification finding would be based upon a broader inquiry than mere assessment of adverse effects at the local unit level.]" (USDI Fish and Wildlife Service 1996a).

In the following discussion, effects on critical habitat are evaluated in terms of effects on the primary constituent elements of critical habitat, namely trees with platforms suitable for nesting and young forests with an average height equal to $\frac{1}{2}$ the site potential tree height that are within $\frac{1}{2}$ mile of trees with platforms suitable for nesting. Effects of the proposed action on these primary constituent elements are viewed in both quantitative and qualitative terms. These effects are considered in the context of designated critical habitat at various scales, and in regard to the reasons for designation. The only critical habitat unit that includes lands within the SYP/HCP area is CA-03-a. Harvest within this unit would have no effect on critical habitat in the other five local units. Thus, the following discussion focuses on effects on CHU CA-03-a.

In quantitative terms, forested acres containing primary constituent elements, and thus designated as critical habitat, would be allocated in three ways. Portions would be acquired as part of the Headwaters Reserve, portions would be set aside for the life of the permit in MMCAs, and other portions would be available for harvest, unless protected under other constraints such as riparian protection. These effects are summarized in table 58.

Table 58. Effects on Critical Habitat in Unit 03-a

	Uncut OG DF	Residual OG DF	Uncut OG Redwood	Residual OG Redwood	Late-seral 1/	Total
Headwaters	0	0	3,091	647	795	4,533
Owl Creek MMCA2/	13	6	356	332	45	752
Other MMCAs	189	8	1,083	1,998	163	3,440
Outside Reserves	0	31	92	1,674	1,784	3,581
Total	202	45	4,622	4,651	2,786	12,306

1/ This category only includes late-seral habitat without a residual component that is within 0.5 miles of any uncut or residual old-growth stand.
2/ Owl Creek MMCA listed separately because it may be either acquired permanently or provided MMCA status

In quantitative terms, the amount of critical habitat (3,581 acres) that would be left unprotected by the acquisition of Headwaters and set-aside of the MMCAs comprises about 29 percent of the critical habitat in CHU CA-03-a, about 7.8 percent of the critical habitat in CHUs in proximity to the action area, about 1.1 percent of the critical habitat in Conservation Zone 4, and about 0.3 percent of the critical habitat in the three-state range.

Qualitative factors relating to murrelet habitat, including occupancy status, stem density, canopy closure, stand size, and proximity to high quality habitat, are thoroughly discussed elsewhere in this opinion. In general, the same conclusions as to effects apply to critical habitat as to habitat in more general terms. Harvest under the SYP/HCP would be focused on lower quality habitat in young forest, residual stands, and small old-growth stands; while the highest quality habitat in larger old-growth stands and associated residual stands would be acquired or set aside as MMCAs. Of the 3,581 critical habitat acres in CHU CA-03-a that are not included in the Headwaters acquisition or MMCAs, 48 percent is in residual stands, which have lower availability of nesting substrate than uncut old-growth and likely support a lower level of murrelet reproductive output, and 50 percent is in late-seral stands that contain no known nesting substrate. Only two percent of the critical habitat acreage left un-acquired or outside MMCAs would be within uncut old-growth stands.

Of the 1766 acres of uncut old-growth and residual critical habitat acreage left un-acquired or outside MMCAs by the murrelet conservation plan, an estimated 32 percent will be included in Riparian Management Zones, where it would be protected either completely in no-cut buffers or protected partially in selection cut buffers (O. Rand, pers. comm., February 5, 1999). Habitat in riparian zones probably does not constitute high quality habitat because of lack of interior forest conditions, but it may provide some habitat benefits, especially as the size of second-growth increases within the buffers. Thus, due to qualitative factors and protection under other prescriptions, the degree of effect would be substantially less than that indicated in the simple numeric proportion of quantitative effect.

Of the 1,784 acres of late-seral stands within critical habitat that will not be protected by the murrelet conservation plan, 965 acres are on lands that will be acquired from Elk River Timber Company along the northern boundary of the proposed Headwaters Reserve. Along the edge of the reserve, within these lands, a 300-foot-wide buffer would be applied that would be subject to

the late-seral selective harvest prescription, leaving a closed canopy buffer to provide protection from predators and climatic effects. The remainder of the area could be harvested. Thus the overall beneficial buffering effects of late-seral critical habitat will be reduced in this area, but retained along the margin of the reserve.

Critical habitat on private lands was designated in areas where Federal lands are limited or nonexistent, and where private lands are essential for maintaining marbled murrelet nesting populations and nesting habitat. The focus of designation was on protection of large contiguous blocks of nesting habitat, and maintenance of current distribution of the species. The designation of CHU-CA-03-a attempted to meet these criteria by including the largest blocks of nesting habitat in an area with no Federal lands. However, because none of the existing blocks of nesting habitat on the PALCO property (or other private property in the area) exceed 3,200 acres, no truly large blocks of habitat such as exist in Redwood National Park or Federal LSRs are available in CHU-CA-03-a. The primary value within the CHU is contained within the 3,000-plus acres of the Headwaters/Elkhead Springs stands, with secondary value contained in four other stands with several hundred acres of uncut old-growth each, and in numerous scattered stands of residual old-growth. Almost 28,000 acres of the CHU (nearly 70 percent) contains young forest largely devoid of primary constituent elements; by definition these acres do not constitute critical habitat. Because these young stands are not legally protected from harvest, and because public acquisition of these lands is unlikely, there appears to be little possibility that a truly large block of murrelet nesting habitat could be created in this CHU. Thus, practically speaking, most of the recovery value for this unit is contained in the existing occupied habitat. If marbled murrelet populations continue to decline, and currently occupied habitat becomes unoccupied as a result, the legal protections for some of today's occupied habitat could be lost, resulting in further harvest of the existing habitat. Therefore, in absence of an HCP, it is doubtful that the existing condition of this CHU can be maintained, much less improved.

Because the proposed action will result in the harvest of designated critical habitat, some adverse effects will occur. However, for the reasons described above, the FWS believes that the most important effect of the proposed project on the value of critical habitat for the survival and recovery of the murrelet is not the negative effect of harvest of lower quality critical habitat, but rather the positive effect of permanent acquisition of the Headwaters and 50-year set-aside in the MMCAs of the largest blocks of the best remaining habitat in the CHU, together with the assured protection of adjacent areas of improving residual habitat and second-growth buffers. This will ensure that the goals of critical habitat designation are met for the long term, and that if populations stabilize and begin to recover, the best of today's available habitat will remain in place to support that population, irrespective of changes in population structure or protective regulation that may occur in the future.

Also among the effects of the action would be a change in the legal status of designated critical habitat in the area covered by the SYP/HCP. In the Final Rule designating critical habitat (USDI Fish and Wildlife Service 1996a), the FWS defined critical habitat for the marbled murrelet to exclude lands covered by a legally-operative ITP, including permits issued subsequent to the

designation. This exclusion is to apply during the period the permit is in effect. Because the lands protected under the SYP/HCP would fill the role of designated critical habitat, this change in legal status would have no biological effect. If for some reason the permit were terminated, those lands that are currently critical habitat would revert to critical habitat status.

Western snowy plover

The analysis area used in this opinion includes all gravel bars on the Eel River that have the potential to be suitable nesting and brood rearing habitat. The SYP/HCP, as currently proposed, does not include the removal of gravel from gravel bars on the Eel River as a covered activity, except as incidental to placement and operation of low-water road crossings. Commercial gravel operations will not be conducted on gravel bars under the authority of the SYP/HCP.

Direct and indirect effects

Currently, no known snowy plover nesting or wintering sites are known to occur on PALCO lands or within any "vested rights" area (those lands where rights to gravel extraction are under the control of PALCO). Western snowy plovers have not been documented on PALCO lands (CDFG 1998a, PALCO 1998). The CDFG has no record of this species occurring on Elk River Timber Company lands of the project area, and it is not expected to occur there based on the known distribution of the species and the lack of sufficiently wide river-gravel bars. Therefore, no acres of currently occupied breeding or wintering habitat are likely to be affected by current activities covered under this SYP/HCP, and no direct adverse effects to the species are likely to occur.

Two circumstances could occur which might lead to SYP/HCP-covered activities potentially affecting the western snowy plover: the future PALCO acquisition of plover habitat or the detection of plovers on current PALCO lands. Should PALCO acquire lands or vested rights that include gravel bars or habitat adjacent to known plover nesting areas at some time during the life of the plan, the potential exists for PALCO activities to affect the species through habitat modification or disturbance.

The relatively recent discovery (during 1996) of plovers nesting on the lower Eel River gravel bars (Tuttle et al. 1997) may indicate that the species has only recently begun to adapt its nest habitat selection. Should this be true, the current distribution of the western snowy plover on the Eel River, as documented through recent intensive surveys, may be gradually expanding upriver to include additional gravel bars if they have the characteristics of suitable habitat. It is not possible to predict the exact upstream limit of breeding habitat for this species, given the amount and location of existing survey data. The condition of the gravel bars on this stretch of the river may provide characteristics that would lead to the eventual use of these bars by snowy plovers. On this portion of the river, the gravel bars are wider and more gradually sloped than are those bars in the faster flowing and generally more constrained stream channel upstream from the bridge at Rio Dell, California. Therefore, some potential remains for future activities conducted under the SYP/HCP and ITP to affect the plover on existing PALCO lands and vested rights gravel bars upstream from the mouth of the Van Duzen River.

To minimize and mitigate for these potential sources of effects to this species, the snowy plover conservation plan establishes two criteria for nest site detection and protection. The SYP/HCP conservation measures for the western snowy plover call for PALCO to conduct reconnaissance-level surveys (as described in COE gravel extraction permits for the area) on gravel bars upstream from the Highway 101 bridge near Rio Dell. If reconnaissance-level surveys locate plovers above the Rio Dell bridge, full protocol surveys will be instituted on all gravel bars within one mile of the sighting. If plovers are detected, the individual(s) shall be observed for evidence of nesting behavior. If a nest site is discovered, a 1,000-foot seasonal operations buffer will be applied until the end of the breeding season, or until it is determined that the nest has failed or nesting has been completed.

If PALCO acquires rights to gravel bars downstream from Rio Dell, those bars shall be surveyed in full compliance with FWS protocol existing at the time, and nest protection measures shall be implemented that are consistent with measures used on the lower Eel River area at the time. If the species' breeding range is determined by any means to extend up the Eel River to the Rio Dell bridge, PALCO shall begin full protocol surveys of gravel bars above the Rio Dell bridge, and if nests are located, PALCO shall implement nest protection measures as above. PALCO shall evaluate proposed gravel extraction levels with respect to potential indirect effects downstream. Within three years of permit issuance, PALCO and the agencies will meet to evaluate indirect effects of extraction on downstream gravel bars and to determine whether practicable mitigation measures would be appropriate.

The conservation plan provides for adequate protection of the western snowy plover should they be found on PALCO lands at any time during the life of this SYP/HCP. We determine that there will be no significant effects to the species for the life of the ITP.

Southern Oregon/Northern California Coast ESU coho salmon

Refer to Effects common to Pacific salmonids.

PROPOSED SPECIES/CRITICAL HABITAT:

Southern Oregon and California Coastal ESU chinook salmon

Refer to Effects common to Pacific salmonids.

Coho salmon critical habitat

Refer to Effects common to Pacific salmonids.

Chinook salmon critical habitat

Refer to Effects common to Pacific salmonids.

UNLISTED SPECIES

Bank swallow

Direct effects

The FWS has determined that the proposed action is not likely to adversely affect the bank swallow for the following reasons: this species is not known to occur in the action area; the action area constitutes an exceedingly small and relatively insignificant portion of its range, both within the regional area and range-wide; aquatic conservation measures, principally the CMZ and RMZ measures, will minimize potential impacts to this species should they occur in the future; survey requirements for new road construction which crosses low gradient Class I streams will identify any new colonies that could be impacted; any colonies that are found will be protected and monitored by the conservation measures stated in the SYP/HCP and/or by measures developed during required consultation with the FWS and CDFG; and it is not anticipated that any bank swallows would be injured or killed as a result of the proposed action. While the FWS does not anticipate that any active colonies would be destroyed, if surveys fail to detect bank swallows, nest sites could be destroyed. Because the presence of a nest colony is usually quite obvious, it is unlikely that this will occur.

Indirect effects

Changes in flow regime as a result of timber harvest, road construction, and other covered activities could result in decreases or increases in suitable riverbank nesting habitat in the future. These effects, should they occur, would be more pronounced lower in drainages. The FWS anticipates no other indirect effects on this species.

Pacific fisher

Direct effects

Species

Numbers

Although fisher have been detected on PALCO lands, data are not available on the current number of fisher within the regional or action areas. The lack of information available on the extent of fisher use of redwood-dominated forest types make it difficult to quantify the change in number of fishers expected as a result of implementation of the SYP/HCP. However, due to the limited amount of LSH outside of PALCO lands within the action area, the number of fisher within the action area is expected to decrease, due to substantial reduction in the amount of LSH on PALCO lands. The decrease in numbers would not be directly proportional to reductions in the amount of LSH, due to the following: 1) the irregular distribution of larger patches of LSH on PALCO lands throughout the permit period; and 2) the fact that fishers may use additional habitats not included in the definition of LSH, such as CWHR 4D stands which provide structural components important to fishers.

Distribution

Fisher have only been detected within the Humboldt Bay and Yager Creek WAAs on PALCO lands. Retention of LSH within the Humboldt Bay and Yager Creek WAAs is likely to provide

the best distribution of resting and denning habitat on PALCO lands. PALCO owns 30 percent (38,985 acres) of the Humboldt Bay WAA and 40 percent (33,730 acres) of the Yager Creek WAA. These two WAAs combined account for approximately 34 percent of the PALCO ownership. Habitat that appears suitable is also present in other WAAs. Assuming that all potentially suitable LSH is occupied, the distribution of resting and denning habitat on PALCO lands within the Van Duzen River, Eel River, and Bear Mattole WAAs is expected to be substantially reduced by the end of permit period. However, public lands within and directly adjacent to these WAAs are likely to provide resting and denning habitat throughout the permit period and beyond. Refer to the **Effects common to species associated with late-seral habitat** and **Effects to Pacific Fisher suitable habitat** sections for additional information.

Reproduction

Fishers are sensitive to forest fragmentation (Rosenberg and Raphael 1986). Female fishers are the sole providers for their young, and generally have smaller home range sizes than males. Adult females, because of their increased energy demands while raising young, are likely more sensitive to changes in the composition and structure of forests at a smaller spatial scale than males.

The abundance and distribution of LSHs will be reduced across PALCO lands. This effect is most pronounced in the reduction of patches of LSH greater than 80 acres in size. Fragmentation of LSHs will likely impact the reproductive success of fishers by limiting the ability of females to capture prey and find denning or resting sites, while minimizing energy expenditure. Although conservation measures will retain some structural components, timber harvest operations are likely to destroy potential rest and den sites, since harvest activities typically occur in older stands which are likely to contain the highest density of habitat components used for resting and denning. These factors combined are likely to negatively effect fisher reproduction in the action area.

Coniferous forest seral stages other than LSH have the potential to provide opportunities for suitable den and rest sites through the retention of structural components (e.g., snags, live culls, and down logs) during timber harvest. When young timber stands grow to reach CWHR 4D, the retention of these structural components may provide opportunities for denning.

Injury or disturbance

Timber harvest operations could disturb fisher reproductive activities. Direct injury of adult fishers from timber harvest activities is unlikely, due to the subspecies high agility and human avoidance behavior. However, natal dens occupied by adult females and young kits could be destroyed during timber felling, skidding, and yarding operations.

Vehicle traffic is known to kill Pacific fishers. The abundance of roads within the PALCO ownership make it possible that vehicle traffic associated with covered activities could kill fishers. **Conservation needs guideline # 8** listed above for this species is to maintain "open-to-public" road densities to no more than 2 miles per square mile. Road densities on PALCO lands vary widely. Within the Humboldt Bay WAA, the Little South Fork of the Elk River watershed has 1.4 miles per square mile, while the Graham Gulch watershed, a tributary to Freshwater Creek,

has 7.9 miles per square mile. Within the Yager Creek WAA road densities range from 4.9 miles per square mile to 6 miles per square mile. Within the Van Duzen WAA road densities range from 2.9 miles per square mile in the Cummings Creek watershed to 5.5 miles per square mile in the Root and Grizzly Creek watersheds. Within the Bear/Mattole WAA road densities range from 1.9 miles per square mile in the Rattlesnake Creek watershed to 3.9 miles per square mile in the Green Ridge watershed. Road density will increase on the PALCO ownership throughout the permit period. Although road densities on most of PALCO lands are higher than 2 miles per square mile, few roads on the ownership are open to the public or receive sustained use, and most do not receive high speed traffic. Therefore, minimal impacts from vehicle traffic are expected. In addition, many dirt logging roads are less than 30 feet wide and are likely to maintain a canopy cover of at least 40 percent, and therefore are not expected to be a barrier to fisher movement.

Suitable habitat

Habitat protection and modification

Suitable fisher habitat will be protected and maintained through RMZ measures, the mass wasting avoidance strategy, cumulative effects/disturbance index restrictions, habitat retention around spotted owl activity centers, MMCAs, the retention standard of 10 percent LSH for each WAA, and conservation measures for structural components. For additional information on habitat modification and projected amounts of LSHs, refer to **Effects Common to Species Associated with LSH**.

In addition to LSH, CWHR 4D may provide suitable habitat for resting and denning when it contains structural components used by fishers. The conservation measures in the SYP/HCP include requirements for retention of structural components often used by fishers for rest and den sites. The LTSY projections estimate that at least 49,962 acres of CWHR 4D will be maintained on the ownership during the plan period. See table 59 for projected distribution of CWHR 4D for the five major WAAs on PALCO lands over the permit period by WAA.

Table 59. Projected acres of CWHR 4D by WAA by decade on PALCO lands and percent of PALCO lands of CWHR 4D within each WAA by decade for the permit period, based on LTSY information.

Decade	Humboldt Bay WAA		Yager Creek WAA		Van Duzen River WAA		Eel River WAA		Bear/Mattole WAA	
	acres	per-cent	acres	per-cent	acres	per-cent	acres	per-cent	acres	per-cent
Baseline	7820	20	8629	26	8058	32	15351	21	13966	46
1	6859	18	6381	19	6276	25	13558	18	14505	47
2	10652	27	12605	37	9876	40	20896	28	16920	55
3	11497	29	19361	57	7327	29	26779	36	12114	40
4	14983	38	12881	38	7760	31	27338	37	12256	40
5	16795	43	9293	28	11043	44	35548	48	7145	23

Conservation needs guideline # 9 listed above for this species is to maintain 60 percent of PALCO lands in each WAA throughout the permit period in CWHR 3M or larger. This guideline is expected to be met. See table 60 for projected distribution of CWHR 3M or larger within the 5 major WAAs on PALCO lands over the permit period.

Table 60. Projected acres of CWHR 3M or larger on PALCO lands by WAA by decade and percent of PALCO lands in CWHR 3M or larger within each WAA by decade, based on LTSY information.

Decade	Humboldt Bay WAA		Yager Creek WAA		Van Duzen River WAA		Eel River WAA		Bear/Mattole WAA	
	acres	per-cent	acres	per-cent	acres	per-cent	acres	per-cent	acres	per-cent
Baseline	32523	83	20176	60	21633	87	55702	75	23445	77
1	26526	68	29592	88	20750	83	50440	68	24541	80
2	30358	78	30789	91	17708	71	55554	75	24822	81
3	29485	76	27546	82	16463	66	62116	84	21339	70
4	31510	81	23756	70	20557	82	61890	84	18456	60
5	30635	79	23563	70	21231	85	60491	82	18870	62

In addition to PALCO lands, public lands (State parks) within the Humboldt Bay, Yager Creek, and Eel River WAAs contain approximately 43,330 acres of potentially suitable foraging habitat for fishers. An additional 6,665 acres of CWHR 3M or larger within the Headwaters Reserve are expected to persist as foraging habitat throughout the life of the permit and beyond.

Habitat removal

Using a "worst-case" estimate, LSH could be reduced within the PALCO ownership from 32 percent (69,231 acres) to 10 percent (21,170 acres) of the ownership. This would constitute a 69 percent (47,304 acre) decrease in the amount of LSH. However, using LTSY projections over the permit period, the amount of LSH will likely be higher than 10 percent throughout the entire permit period. Refer to **Effects common to species associated with LSH** for LTSY projections.

Habitat classified as CWHR 4D (potential resting and denning habitat) would be reduced from 26 percent (55,380 acres) to 23 percent (49,205 acres) of the ownership in the first decade, then increase to 38 percent (80,580 acres) of the ownership by the end of the permit period.

Habitat classified as CWHR 3M or larger (potential foraging habitat) would be expected to vary little during the permit period. CWHR 3M will increase from 73 percent (155,041 acres) to 76 percent (162,237 acres) of the ownership in the second decade, and then decrease to 74 percent (157,394 acres) of the ownership by the end of the permit period.

Habitat distribution and fragmentation

Fragmentation of LSH will increase throughout PALCO lands over the permit period. The total acreage in patches of LSH greater than 80 acres in size will decrease by 65 percent. The degree of fragmentation will vary by WAA. Refer to the **Effects Common to Species Associated with LSH**, section for discussion on LSH.

Conservation needs guideline # 1 listed above for this species is to maintain at least 40 percent of suitable fisher habitat within a subdrainage as mature or older forests in patches of at least 80 acres in size. Habitat classified as CWHR 3M or larger is considered potentially suitable foraging habitat for fisher. The amount of potentially suitable foraging habitat is expected to vary by no more than approximately 5,000 acres over the permit term, and is not expected to go below the current level. Using the current acres of CWHR 3M and larger (155,041 acres) as a yardstick, at the end of the permit period 13 percent of PALCO lands that are considered suitable fisher habitat are projected to be maintained in patches of LSH greater than 80 acres in size.

In addition to LSH, habitat classified as CWHR 4D may also provide resting and denning habitat for fishers when structural components used by fishers are present. Using LTSY projections, at least 18 percent of each WAA is expected to be maintained in CWHR 4D over the permit period. When stands of LSH are combined with lower quality CWHR 4D stands, the number of patches of suitable resting and denning habitat larger than 80 acres in size increases over the ownership. Using the current acres of CWHR 3M and larger (155,041 acres) as a yardstick, at the end of the permit period 112,214 acres (72 percent) of PALCO lands that are considered suitable fisher habitat are projected to be maintained in patches of LSH/CWHR 4D greater than 80 acres in size. This figure is likely to be an overestimate of the acreage of habitat on PALCO lands that is actually suitable for resting and denning of fishers, since not all CWHR 4D stands contain suitable structural components for fishers.

Humboldt Bay WAA: In addition to LSH, approximately 16,795 acres of potentially suitable resting and denning habitat (CWHR 4D) and 30,635 acres of potential foraging habitat (CWHR 3M or larger) will be present at the end of the permit period on PALCO lands within the WAA.

Yager Creek WAA: In addition to LSH, approximately 9,293 acres of potentially suitable resting and denning habitat (CWHR 4D) and 23,563 acres of potential foraging habitat (CWHR 3M or larger) will be present at the end of the permit period on PALCO lands within the WAA.

Van Duzen River WAA: In addition to LSH, approximately 11,043 acres of potentially suitable resting and denning habitat (CWHR 4D) and 21,231 acres of potential foraging habitat (CWHR 3M or larger) will be present at the end of the permit period on PALCO lands within the WAA.

Bear/Mattole WAA: In addition to LSH, approximately 7,145 acres of potentially suitable resting and denning habitat (CWHR 4D) and 18,870 acres of potential foraging habitat (CWHR 3M or larger) will be present at the end of the permit period on PALCO lands within the WAA.

Eel River WAA: In addition to LSH, approximately 35,548 acres of potentially suitable resting and denning habitat (CWHR 4D) and 60,491 acres of potential foraging habitat (CWHR 3M or larger) will be present at the end of the permit period on PALCO lands within the WAA.

The reduction in LSH is not expected to constitute a gap in the distribution of Pacific fisher in the regional area. The RMZs are expected to provide LSH suitable for dispersal of young and movement of adults within and between WAAs and suitable habitat adjacent to PALCO ownership. Fishers may use riparian areas more than upslope areas (Aubry and Houston 1992, Buck et al. 1983).

Removal of special habitat components

Special habitat components for rest and den sites will be removed from the landscape during timber harvest operations. However, measures to conserve habitat diversity and structural components will maintain these special components at levels similar to those recommended in the **Conservation needs** section above for the Pacific fisher.

Conservation needs guideline # 3 listed above for this species is to maintain three to six trees per acre with deformities or cavities that are at least 30 inches dbh. This guideline will be met. At least four live cull trees per acre will be retained outside of Class I and II RMZs throughout the PALCO ownership. While there is no requirement to specifically maintain trees with deformities, cavities, or of a specific dbh, 30-inch dbh trees with these characteristics are given priority for retention.

Within Class I and II RMZs, post-watershed analysis prescriptions are expected to provide at least two live cull trees per acre.

Conservation needs guideline # 4 listed above for this species is to maintain 9 to 18 live trees per acre that are at least 20 inches dbh in suitable Pacific fisher habitat (CWHR 3M and larger). This guideline will be partially met. At least 60 percent of each of the five major WAAs on PALCO lands are expected to be maintained in CWHR 3M or larger. The average dbh of trees in this size class range from 6 to 11 inches, therefore it is unlikely that 9 to 18 of the trees present within these stands will be at least 20 inches dbh. When even-aged stands reach a CWHR size class of 4 they will likely meet this guideline. At least 18 percent of each WAA is expected to be maintained in CWHR 4D over the permit period, with at least 23 percent of each WAA in CWHR 4D by the end of the permit period.

Live green trees are expected to be left after harvest in varying numbers and sizes in areas treated with uneven-aged harvest prescriptions. Silvicultural requirements associated with the aquatic conservation strategy, mass wasting avoidance strategy, cumulative effects/disturbance index restrictions, and retention of 10 percent LSH for each WAA are likely to retain large green trees across the landscape. In addition, under the SYP/HCP, all harvest prescriptions include a requirement to leave green replacement trees if snags are not present on site, and at least four live cull trees per acre will be retained after harvest throughout the PALCO ownership.

Class I, II, and III RMZs (no harvest and select harvest bands combined) make up approximately 25 percent of the PALCO ownership prior to watershed analysis. Post-watershed analysis these RMZs could be reduced. However, requirements to retain the 18 largest trees per acre within 170 feet of Class I waters will remain in place. Basal area requirements within these zones are expected to provide at least 9 trees per acre greater than 20 inches dbh.

Conservation needs guideline # 5 listed above for this species is to maintain one to two snags per acre at least 30 inches dbh. This guideline is included in the HCP.. At least 1.2 snags per acre over 30 inches dbh will be retained. In addition, all snags that do not constitute a safety hazard will be retained.

Conservation needs guideline # 6 listed above for this species is to maintain, in addition to # 5 above, two to four snags per acre at least 20 inches dbh. This guideline will be met. At least 2.4 snag per acre over 20 inches dbh will be retained. In addition, all snags that do not constitute a safety hazard will be retained. Harvest prescriptions developed for Class I and II RMZs are expected to exceed this guideline.

Conservation needs guideline # 7 listed above for this species is to maintain two to three down logs per acre at least 20 inches in diameter and 15 feet long. This guideline is expected to be met. Conservation measures for structural components include retention for down logs in this size category if they currently exist on site. Adaptive management included in the SYP/HCP will evaluate after 5 years the need to take a more active role to recruit down logs.

Conservation needs guideline # 10 listed above for this species is to retain a hardwood component in the larger size category present on the site. This guideline will be met. The SYP/HCP measures under structural components will retain all hardwoods, up to two per acre, greater than 30 inches dbh where they exist.

While not all guidelines suggested by Freel (1991) and Heinemeyer and Jones (1994) are fully met, guidelines # 3 through # 7 were intended to apply to no more than 60 percent of the subdrainage being considered. The measures to conserve structural components specified in the SYP/HCP will apply to all PALCO lands.

Dispersal habitat condition

Conservation needs guideline # 2 listed above for this species is to maintain travel corridors at least 300 feet wide with at least 60 percent canopy cover. This guideline will be partially met. Pre-watershed analysis, all Class I and II RMZs will have greater than 80 percent canopy closure (Peters 1998). Since Class II RMZs are only 260 feet wide, the 300 feet wide corridor will not be fully met. However, Class I RMZs exceed the suggested 300 feet width and the overall canopy closure will exceed the guideline.

The SYP/HCP includes provisions to survey for Pacific fishers and consider impacts of harvest prescriptions on fishers during the post-watershed analysis synthesis process. Furthermore,

harvested areas are not expected to constitute barriers to fishers once canopy cover reaches 40 percent. These measures combined are expected to provide adequate dispersal habitat throughout the ownership.

Indirect effects

Predation

Refer to **Effects Common to Species Associated with Late-Seral Habitat** section above.

Injury or disturbance

Use of newly constructed roads to accommodate a variety of non-covered activities may result in disturbance of fishers. The magnitude of this effect could not be quantified for the purpose of this consultation. This effect may be significant due to changes in behavioral patterns of reproducing fishers during the breeding season. Reproduction may be adversely affected. For additional information, refer to **Effects Common to Species Associated with Late-Seral Habitat** section above.

Habitat loss or modification

Refer to **Effects Common to Species Associated with Late-Seral Habitat** section above.

Red tree vole

Direct effects

Species

Numbers

The SYP/HCP does not include conservation measures that specify the maintenance of a particular red tree vole population size. The only data available on numbers of red tree voles are the 90 observation records discussed in the baseline. Currently, data on population estimates are not available for red tree voles on the PALCO lands. Effects of the action are best described in terms of habitat loss and retention (refer to the discussion under **Effects common to species associated with late-seral habitat**). In general, red tree voles are expected to decrease in number as the amount of LSH in patches greater than 80 acres in size decreases over the permit term.

Distribution

The effects of implementation of the SYP/HCP on the distribution of red tree voles within the action area is best estimated as a function of the distribution of LSH. Retention of LSH within the Humboldt Bay and Yager Creek WAAs is likely to provide the best distribution of suitable red tree vole habitat on PALCO lands. PALCO owns 30 percent (38,985 acres) of the Humboldt Bay WAA and 40 percent (33,730 acres) of the Yager Creek WAA. These two WAAs combined account for approximately 34 percent of the PALCO ownership. Assuming that all potentially suitable LSH is occupied, the distribution of red tree vole populations on PALCO lands within the Van Duzen River, Eel River, and Bear Mattole WAAs is expected to be substantially reduced by the end of permit period. However, public lands within and directly adjacent to these WAAs are likely to support red tree vole populations throughout the permit period and beyond. Refer to the

Effects common to species associated with late-seral habitat section for additional information.

The SYP/HCP measures described under effectiveness monitoring for red tree voles are expected to provide additional information on the distribution of red tree voles on PALCO lands.

Reproduction

The abundance and distribution of LSHs will be reduced across the PALCO lands. This is most pronounced in the reduction in acreage of patches of LSH greater than 475 acres in size (47,236 to 6,450 acres). It is likely that fragmentation of LSHs will increase the energy used by red tree voles to locate suitable nest sites within PALCO lands. Conservation measures will retain some structural components (large live culls and green snag replacement trees) important to this species for nesting. Timber harvesting, however, is likely to destroy potential nest sites, since timber harvest would typically occur in older stands which are likely to contain the highest density of habitat components used for nesting. Larger stands of LSH are more likely to contain stable populations, with more consistent reproductive success, than younger-aged stands. These factors combined are likely to negatively affect reproduction of red tree voles in the action area.

Injury or disturbance

Red tree voles occupy their nests year round, using them for shelter and protection from predators. A majority of the LSH within the PALCO lands will be available for harvest. Timber harvest operations (timber felling, skidding, and yarding) are very likely to cause direct injury of red tree voles as well as disrupt breeding, feeding, and sheltering behaviors.

Suitable habitat

Habitat protection and modification

Suitable red tree vole habitat will be protected and maintained through several facets of the operating conservation measures. These facets include the following: RMZ measures; the mass wasting avoidance strategy; cumulative effects/DI restrictions; habitat retention around spotted owl activity centers; MMCAs; the retention standard of 10 percent LSH for each WAA; and conservation measures for structural components. For additional information on habitat modification and protection refer to **Effects Common to Species Associated with LSH**.

In addition to LSH, CWHR 4D may provide suitable habitat of a lower quality. The LTSY projections estimate that at least 49,205 acres of CWHR 4D will be maintained on the ownership during the permit period. See table 59 for the projected distribution of CWHR 4D over the permit period.

The red tree vole conservation plan within the SYP/HCP includes adaptive management. Habitat information gained from effectiveness monitoring will be used to evaluate conservation measures and potential changes necessary to meet the management objective of sustaining viable red tree vole populations within each WAA throughout the life of the permit.

Habitat removal, distribution, and fragmentation

Refer to the **Effects common to species associated with late-seral habitat** section. In addition to LSH, CWHR 4D may provide suitable habitat of a lower quality for red tree voles. Habitat classified as CWHR 4D is also considered potentially suitable habitat for the Pacific fisher. Refer to the discussion under the **Effects on the Pacific Fisher**.

Conservation needs consideration # 1.a identified above for this species is to provide patches of suitable habitat at least 75 acres in size, and preferably 475 acres in size. The MMCAs are expected to provide several blocks of higher quality (LSH) habitat at least 80 acres in size, as well as patches of LSH at least 475 acres in size within the Humboldt Bay and Yager Creek WAAs throughout the permit period.

Within the Van Duzen River WAA, acreage of LSH in patches at least 80 acres in size will decrease from 4,968 to 2,228 acres over the permit period. By the end of the permit period, all of the LSH patches in this WAA are projected to be less than 475 acres in size.

Within the Eel River WAA, acreage of LSH in patches at least 80 acres in size will decrease from 27,318 to 6,224 acres over the permit period. By the end of the permit period, only one of these patches will be greater than 475 acres in size.

Within the Bear Mattole WAA, acreage of LSH in patches at least 80 acres in size will decrease from 4,556 to 2,578 acres over the permit period. By the end of the permit period, all of the LSH patches in this WAA are projected to be less than 475 acres in size.

In addition to LSH, habitat classified as CWHR 4D may also provide nesting habitat for red tree voles when structural components used by red tree voles are present. Using LTSY projections, at least 18 percent of each WAA is expected to be maintained in CWHR 4D over the permit period. When stands of LSH are combined with CWHR 4D stands, the number of patches and acreage of potentially suitable habitat patches larger than 475 acres in size increases over the ownership. Refer to **Effects to the Pacific fisher** section above for additional information on CWHR 4D habitat patches.

In addition to PALCO lands, the Headwaters acquisition area and other public lands within the action area are also expected to provide patches of LSH greater than 475 acres in size throughout the permit period and beyond.

Removal of special habitat components

Although conservation measures will retain some structural components (large live culls and green snag replacement trees) important to this species for sheltering and nesting, timber harvest is likely to destroy potential nest sites, since timber harvest would typically occur in older stands, which are likely to contain the highest density of habitat components used for nesting.

Dispersal habitat condition

The SYP/HCP measures described under effectiveness monitoring for red tree voles are expected to provide additional information on the distribution of red tree voles in the PALCO lands. The SYP/HCP also includes provisions to survey for red tree voles and to consider impacts of harvest prescriptions on red tree voles during the post-watershed analysis synthesis process.

Conservation needs consideration # 1.b identified above for this species is to provide dispersal habitat between patches of LSH of coniferous forests with a canopy cover of at least 60 percent. CMZs and RMZs are expected to provide dispersal corridors throughout PALCO lands that meet this criteria. Furthermore, harvested areas are not expected to constitute barriers to red tree voles once canopy cover reaches 60 percent. As a result, while fragmentation of LSH is expected to increase, connectivity between LSH and adjacent public lands will be maintained across the ownership.

Indirect effects

Predation, Injury or disturbance, Habitat loss and modification

Refer to Effects Common to Species Associated with Late-Seral Habitat section above.

Northern red-legged frog, foothill yellow-legged frog and northwestern pond turtle

Direct effects

For these three species, the most important effect of the action will be the improving condition of habitat provided by the RMZs. However, each species may be negatively affected by continued effects of past management, and by timber management activities in habitat that extends beyond the width of RMZs. FWS used different distances from the waters edge to estimate the amount of suitable habitat for each species as described below.

Based on data collected on pond breeding salamanders with similar habitat requirements, Welsh et al. (1998) suggests a buffer distance of approximately 530 feet as recommended by Semlitsch (1998) likely would be sufficient for long-term maintenance of northern red-legged frog populations. Higher quality habitat expected to be used by the subspecies includes mid- and late-seral, old-growth and residual old-growth.

Habitat within 230 feet from the waters edge of Class I and II waters was considered suitable for foothill yellow-legged frog habitat (see Action Area Baseline for explanation).

All forested habitat within 1,640 feet from the waters edge of Class I and II's on slopes less than 50 percent could be considered potentially suitable for the northwestern pond turtle (Holland 1994, Reese and Welsh 1997). However, based on field experience on the PALCO ownership, it is likely that much of this acreage is not suitable for or accessible to turtles. It is also likely that only a small portion of the Class I and Class II streams is suitable habitat for turtles, due to high gradient and lack of pools. Lacking data to support a quantitative evaluation of the amount of suitable habitat, we have reported the entire acreage, with the understanding that it represents a substantial overestimate of the actual amount of habitat present for northwestern pond turtles

Species

Numbers and reproduction

Population levels and reproductive rates of the northern red-legged frog, foothill yellow-legged frog, and northwestern pond turtle are not known for PALCO lands or the action area. The proposed action would result in the loss or modification of an unknown proportion of available suitable habitat which would likely result in the loss of an undetermined number of individuals on PALCO lands. Adverse impacts on the numbers and reproductive rate of the subspecies and species are expected as a result of timber harvest proposed for terrestrial habitats used by the subspecies and species, continued impacts from past management, and potential losses of recruitment into the populations. Future impacts may be even more pronounced for the subspecies and species because of the current fragmented condition of forested habitats on the landscape. However, the improving condition of RMZ buffers substantially larger than those in place for the past 100 years should provide for increasing populations.

Distribution

The exact distribution of northern red-legged frogs, foothill yellow-legged frogs, and northwestern pond turtles on PALCO lands and the action area is not known. It is expected the subspecies and species would remain generally distributed throughout PALCO lands because suitable aquatic habitat and adjacent terrestrial habitat will improve through time as provisions in the HCP for these areas are implemented. Localized effects on northern red-legged frog, foothill yellow-legged frog, and northwestern pond turtle distributions to occur may continue where terrestrial habitat is used outside RMZs. Effects will be commensurate with the amount and intensity of timber harvest. Even-aged prescriptions and road construction likely would have a greater impact on the distribution of the subspecies and species compared to selection harvest prescriptions due to a higher proportion of disturbed ground and removal of protective canopy.

Injury or disturbance

The subspecies and species are known to use upslope habitat beyond the distances proposed in the RMZs; therefore, timber harvest, road construction, and other activities could kill, injure or disturb an undetermined number of individuals. However, during the winter season, when amphibians are most likely to be found outside the riparian zone, several factors will reduce the likelihood of direct impact. The HCP's weather road use limitations will limit access by heavy equipment during this period, and the FPRs prohibit tractor logging on saturated soils, confining yarding to cable or aerial methods. These factors, in combination, should reduce the likelihood of injury or disturbance of the individuals found near key habitat areas (i.e., aquatic habitats), but will not fully avoid impacts. Because some northwestern pond turtle nesting probably occurs outside the RMZs during summer months, timber harvest activities may adversely affect nesting individuals. The proportion of the population nesting outside RMZs is unknown, so the importance of this effect cannot be determined.

Suitable habitat

Habitat protection

Suitable habitat in RMZs would most likely be protected in areas restricted from timber harvest, road construction, or other activities which would directly alter suitable habitat. Before watershed analysis, minimum no harvest buffers along Class I and Class II streams include a total of 13,697 acres distributed as follows: 0 to 100 feet on Class I streams (7,121 acres); and 0 to 30 feet on Class II streams (5,576 acres). After watershed analysis, minimum and maximum no harvest buffers along Class I and Class II streams would protect a range of acres distributed as follows: 30 to 170 feet on Class I streams (2,143 to 11,872 acres, respectively); and 30 to 170 feet on Class II streams (5,576 to 29,993 acres, respectively). It is likely that the results of watershed analysis will provide protection for a total number of acres somewhere in between 7,719 and 41,865 acres.

The Headwaters Forest would protect an additional 17 miles of Class I streams, 27 miles of Class II streams, and 77 acres of wetlands. MMCA's are estimated to contain 117 miles of Class I and Class II streams.

The protection of suitable habitat within no harvest buffers in RMZs and in areas identified outside RMZs would benefit the northern red-legged frog, foothill yellow-legged frog, and northwestern pond turtle, and in the long-term is expected to increase suitable habitat for each subspecies and species, given current management practices and the fragmented condition of the landscape.

Northern red-legged frog

Habitat loss and modification

The proposed action may result in the loss or modification of an undetermined amount of suitable habitat.

Including all acreage outside no-cut zones and within 530 of streams as an analysis area, the potential area affected could range between 92,668 and 126,814 acres of potential habitat that could be modified (table 61). However, consideration of amphibian needs during post-WA prescription setting, as required in the HCP, should minimize adverse effects in RMZs, and most effects should be confined to localized upland areas outside those zones. Timber harvest and prescribed fire may reduce the amount of standing or downed wood in some areas, thus reducing the recruitment of coarse wood into the aquatic system, and hence, structure needed to create pools for the northern red-legged frog. Snag and downed log retention requirements, combined with buffer zones in RMZs, should minimize the impact of this habitat modification. Refer to **Effects Section for tailed frog** for further discussion pertaining to coarse woody debris. It is assumed that water temperatures will improve gradually and consistently throughout the plan period as younger forested stands in RMZ's develop greater height and total canopy mass resulting in more favorable conditions for the northern red-legged frog.

Table 61. Amount of potentially suitable northern red-legged frog habitat subject to removal or modification due to implementation of the PALCO SYP and HCP, Humboldt County, CA.

Stream class	Distance (ft.) from water's edge	Total acres within zones
Class I - Pre WA ¹	100-170 ² - select Rx ³ >170-530 -any Rx	4,751 25,799
Class II - Pre WA	30-130 ² - select Rx >130-530 - any Rx	18,315 72,485 Subtotal:121,350
Class I & II - Post WA minimum Class I & II - Post WA maximum	30 ² -530 - any Rx 170 ² -530 - any Rx	126,328 92,182
Wetlands		486

¹ WA = watershed analysis.

² Distance represents outer band of RMZ.

³ Rx = prescription.

Foothill yellow-legged frog

Habitat loss and modification

The proposed action may result in the loss or modification of an undetermined amount of suitable habitat. Implementation of the aquatic conservation plan will minimize effects to foothill yellow-legged frog habitat, however, some upland habitat will be harvested. It is assumed that water temperatures will improve gradually and consistently throughout the plan period as younger forested stands in RMZ's develop greater height and total canopy mass resulting in more favorable conditions for the foothill yellow-legged frog. A total of approximately 16,724 to 50,870 acres of potentially suitable terrestrial habitat could be removed or modified depending upon the post-watershed analysis buffer implemented (table 62). This amount does not include indirect effects on aquatic habitats.

Timber harvest and prescribed fire may reduce the amount of standing or downed wood in some areas, thus reducing the recruitment of coarse wood into the aquatic system, and hence, structure needed to create pools for the yellow-legged frog. Snag and downed log retention requirements, combined with buffer zones in RMZs, should minimize the impact of this habitat modification. Please refer to Effects Section for tailed frog for further discussion pertaining to CWD.

Table 62. Amount of potentially suitable foothill yellow-legged frog habitat subject to removal or modification due to implementation of the PALCO SYP and HCP, Humboldt County, CA.

Stream class	Distance (ft.) from water's edge	Total acres within zones
Class I - Pre WA¹	100-170 ² - select Rx ³ >170-230 -any Rx	4,751 4,490
Class II - Pre WA	30-130 ² - select Rx >130-230 - any Rx	18,315 17,850 Subtotal: 45,406
Class I & II - Post WA minimum Class I & II - Post WA maximum	30 ² -230 - any Rx 170 ² -230 - any Rx	50,384 16,238
Wetlands		486

¹ WA = watershed analysis.

² Distance represents outer band of RMZ.

³ Rx = prescription.

Northwestern pond turtle

Habitat loss and modification

As stated earlier, analysis of effects of habitat removal is confounded by lack of information on turtle use of local habitat and on suitability of local conditions. Incorporating into analysis all acreage within the maximum distance turtles have been found from water in other studies, an estimate of up to 191,281 acres of PALCO land (about 95 percent of the property) could be turtle habitat subject to effects (Table 63). This is clearly a substantial overestimate, but there are no data available for determination of more reasonable estimates.

Therefore, the FWS concludes that outside RMZs an unknown amount of habitat could be affected by timber harvest and associated activities. Such effects would probably be focused near riparian zones, in localized areas where turtles find favorable conditions for nesting or estivation. Whether impacts of harvest on such habitats are permanent is unknown. Within RMZs, implementation of the WA reptile/amphibian module and consideration of the species' needs in prescription setting should result in considerable improvement in habitat conditions over time.

Timber harvest and prescribed fire may reduce the amount of standing or downed wood in some areas, thus reducing the recruitment of CWD into the aquatic system, and hence, pools for rearing, and basking or resting sites for the turtle. Snag and downed log retention requirements,

combined with buffer zones in RMZs, should minimize the impact of this habitat modification.. Refer to **Effects Section for tailed frog** for further discussion pertaining to CWD.

Table 63. Amount of potentially suitable northwestern pond turtle habitat subject to removal or modification due to implementation of the PALCO SYP and HCP, Humboldt County, CA

Stream class	Distance (ft.) from water's edge	Total acres within zones
Class I - Pre WA¹	100-170 ² - select Rx ³ >170-1,640 -any Rx	4,751 83,277
Class II - Pre WA	30-130 ² - select Rx >130-1,640 - any Rx	18,315 79,959 Subtotal: 186,302
Class I & II - Post WA minimum	30 ¹ -1,640 - any Rx	191,281
Class I & II - Post WA maximum	170 ¹ -1,640 - any Rx	157,135
Wetlands		486

¹ WA = watershed analysis.

² Distance represents outer band of RMZ.

³ Rx = prescription.

Indirect effects on northern red-legged frog, foothill yellow-legged frog, and northwestern pond turtle

Habitat loss or modification

The proposed action may indirectly affect the northern red-legged frog, foothill yellow-legged frog, and northwestern pond turtle as a result of a reduction in the quantity or quality of both terrestrial and aquatic suitable habitat. Over the permit period, a substantial number of acres of potentially suitable habitat would be subject to timber management.

The SYP estimates a total harvest of approximately 54,400 acres (26 percent of total ownership) within the first decade. Of this projected harvest, the majority (about half) is projected to occur within the Eel WAA (FEIS, table 3.4-7). The next highest proportion of harvesting is expected to occur in the Humboldt Bay WAA, where 12,772 acres (23 percent) of the first decade's harvest is proposed. Therefore, impacts to the northern red-legged and foothill yellow-legged frogs and the pond turtle might be highest in these watersheds. However, it should be noted that other factors can influence the degree of impacts resulting from similar actions in different locales. These may

include, but are not limited to the following: soil types; existing vegetative conditions; surface erosion potential; and weather systems.

Timber harvesting activities can influence vegetation composition, hydrologic processes, sediment transport, stream temperatures, water quality, nutrients, habitat structure, and numbers and composition of aquatic biota. Influences on aquatic habitats are summarized in detail in the **Effects Common to Aquatic Species** section. Indirect effects on the northern red-legged frog, foothill yellow-legged frog, and northwestern pond turtle in both the terrestrial and aquatic environments could include decreased upland foraging habitat, decreased prey base, decreased water quality for egg masses or foraging, decreased basking sites, and refugia or escape cover.

However, compared to current management practices, implementation of riparian prescriptions within RMZs and other additional protective measures outside RMZs, such as steep slope and mass wasting provisions, will result in long-term increases in coarse wood recruitment and long-term decreases in sedimentation yields. Implementation of these prescriptions will minimize impacts of timber harvest within RMZs, but may not allow maximum attainment of these elements if maximum buffer widths are not utilized. Even if the no-cut band widths were enlarged through the watershed analysis process, it is expected that, due to past management practices, the current levels of sedimentation will continue on the order of decades, before an improving trend will emerge. Refer to **tailed frog Effects Section** for further discussion on importance of CWD components and sedimentation factors in the aquatic system.

Tailed frog and southern torrent salamander

These two species are probably more sensitive to effects of timber harvest than the other covered amphibian and reptile species, because they have narrower tolerances to temperature and sediment. In particular, populations of the tailed frog are already suspected to be experiencing the adverse direct, indirect and cumulative effects of intensive forest management. Based on the site-specific results in Wroble and Waters (1989), and on comparative studies with other similar landbases under differing management regimes (Welsh et al. 1998), the FWS believes that ongoing habitat losses and population declines are occurring on the PALCO ownership. Information from nearby industrial forest ownerships (Welsh et al. 1993; Welsh, et al., 1998) - and on nearby public lands subjected to episodic disturbances originating on adjacent lands (Welsh and Ollivier 1998) - also provide evidence of the causal mechanisms for habitat loss and population declines.

Direct and indirect effects

Each of the five effects on physical habitat that are outlined below may occur directly (at the same time and place as the initiating action), or indirectly (delayed effect following present or past actions). The effects of these habitat changes on expected population trends are discussed in the following section, titled "summary of species responses to the proposed action". The FWS is especially concerned about two persistent and adverse habitat effects resulting from past management of PALCO lands; recruitment of LWD and sedimentation (1 and 3 below). In both

instances, conditions may continue to deteriorate for several decades. At that time, the recruitment of late seral acreage in Class II RMZ's will take a sharp upturn, beginning a sustained improving trend (based on the seral stage time series tables in Volume III of the draft HCP). The relationships are discussed in more detail in parts (1)(b1) and (3), below. The FWS considers this timeframe to be unavoidable due to the current low levels of streamside late seral and old-growth acreage in Class II and III RMZ's, and to the time required for younger stands to grow into, at least, a late seral condition.

(1) Recruitment of Instream CWD - This is one of the two factors (the other being (3), below that the Service considers most critical to southern torrent salamander and tailed frog conservation. Pending watershed analysis, the RMZ prescriptions call for 100 foot no-cut buffers along Class I streams, and 30 foot no-cut buffers along Class II and III streams. If selection prescriptions are implemented-cutting bands adjacent to the no-cut bands of Class I and II streams, the selection zones may provide little or no additional LWD recruitment (Reid 1998) because the harvest would remove much of the potential stand mortality before it occurs. However, the selection-cut bands are expected to buffer the no-cut bands from windthrow and to filter sediments (Reid and Hilton 1998), and provide canopy closure.

The expected effects of the RMZ implementation on populations and habitats of both species are as follows: (a) Class I RMZ guidelines will have little or no beneficial effect because both species are largely excluded from those lower reaches by fish predation and warm-water conditions arising from greater stream width and surface exposure. (b) Long term LWD recruitment in Class II and III reaches is problematic for three reasons. First, the forest seral types adjacent Class II reaches are currently skewed to younger age classes. Approximately 33 percent in Class II stream frontage is in late-seral or old-growth condition (SYP/HCP, table 13). Younger stands experience less stand mortality on a volume per-unit-of-time basis, and because down trees are small they are more susceptible to flushing-out during peak flow events. As a result, much of the beneficial effect of the no-cut buffer zones will not materialize immediately, but will accumulate over the decades required for those stands to increase biomass. In the near term, as habitat patches are lost to sedimentation, fewer new suitable patches are being created through channel morphological processes because of the current diminished state of LWD recruitment.

Second, according to Reid's (1998) estimate for Site Class II lands, the 30 foot no-cut band would produce, at most, about 34 percent of the LWD recruitment that would be expected for band-widths equal to the site potential tree height of 230 feet (plus an additional 5 percent originating from the selection-cut band in Class II's). The actual recruitment would be even lower because of the current low amounts (33 percent) of late-seral and old-growth stands adjacent to Class II streams. Even if the no-cut band widths were enlarged through the watershed analysis process, it is expected that, due to past management practices, the current trend of net loss of tailed frog and southern torrent salamander habitat patches will continue for several decades, before an improving trend will emerge.

Third, due to the narrow width of the no-cut bands in Class II and III RMZ's, there is some question about the resilience of the no-cut bands. Class I and II no-cut bands are further "buffered" by selective-cutting zones, which should reduce the incidence of catastrophic windthrows (Reid and Hilton 1998). In contrast, Class III's no-cut bands are "unbuffered" and are found in the upper reaches of drainages with greater exposure to high winds.

(2) Obliteration of Suitable Habitats Through Mass-Wasting Events - Mass-wasting prevention measures in the SYP/HCP should reduce the incidence of direct habitat losses through debris slides. The current prevention measures include prohibitions on harvest around headwalls, inner gorges and unstable areas, and limitations where mass wasting hazard is high-to-extreme. However, in the near term, debris slides may still originate from recent (pre-SYP/HCP) harvests in high-risk areas. There is also cause for concern over continued sediment infusions into streams from recent slides that have not yet stabilized. Since many of the headwall and high-risk areas are in Class III drainages, we expect the mass-wasting provisions will reinforce the Class III RMZ protections. Direct losses of suitable habitat patches due to debris slides are expected to decline in the near and long terms.

(3) Sediment Delivery and Sediment Storage Capability - This is the second of the two factors (the other being (1), above) that the FWS considers most critical to southern torrent salamander and tailed frog conservation. Much of the total sediment yield in a watershed originates from intermittent and ephemeral headwater reaches (mostly Class III's) during peak flow periods. This is attributable to several factors: (a) A significant proportion of land drains into Class III's; (b) headwaters drainages have been disproportionately impacted by harvesting in recent decades (from inspection of Map 5, Vol. V of the Draft SYP/HCP and comparison of published and unpublished (PALCO, 1998) seral stage distribution tables for Class I and II; (c) headwater reaches are mostly intermittent and ephemeral channels and have historically received lower levels of protection through State FPR, so, taken with (b), both the magnitude and intensity of streamside impacts tends to be greater; and (d) stream gradient and sideslopes in low-order streams (e.g., Class III's) tends to be greater than middle and higher order streams (e.g., Class I's and II's) (Sedell, et al., 1988).

Sediment storage capability is constrained by LWD recruitment rates. Based on the seral stage condition of Class III drainages (see (1), above), the FWS concludes that sediment storage capabilities will not recover to desirable levels in the near term, even if RMZ protection measures are maximally effective. As with LWD recruitment (above), the recovery process should unfold over several decades, with interim net losses of suitable habitat in Class II stream reaches due to continuing sediment infusion. The FWS expects that this issue will be examined in depth through the watershed analysis and monitoring review processes. The FWS also foresees that the proposed hillslope protection and road management measures in the Final SYP/HCP (regarding construction, use limits, road repair, road upgrades and limits on harvest in high erosion hazard areas) should produce positive near term results, as they will immediately remedy (or minimize) poor drainage conditions originating from road surfaces. However, the hillslope and road

protection measures may not completely offset the larger and continuous influx of sediments from surface erosion on recently harvested upslope areas, especially in the short term.

(4) Forest Canopy Closure and Microclimate in Streamside Areas - Based on preliminary estimates (Peters, 1998) for Class I and II RMZ's, the FWS believes that the selection cutting regimes should provide adequate canopy closure (approximately 80 percent) to maintain favorable microclimate conditions for both species; but the preliminary model estimates should be verified through monitoring.

(5) Stream Temperature Regimes - Both species are associated with cold water streams and are highly sensitive to warm water infusions (see the discussions on habitat specificity for both species under Life History). Considering the current high percentage of forest openings, young forest and mid-successional stands along Class II and III streams, the Service concludes that water temperatures will improve gradually and consistently throughout the plan period as the younger stands in RMZ's develop greater height and shading capability.

Effects common to amphibians and aquatic reptiles: - interrelated and interdependent effects:

Forest chemicals (i.e., herbicides, pesticides and fertilizers) may be used in connection with PALCO's timber management activities. Herbicides and pesticides may be used to enhance reforestation. Herbicides may be applied aerially or manually to control competing and undesirable plant species. Direct effects to covered species may include exposure to chemicals. Indirect effects may occur due to habitat modification. Fertilizers may be applied aerially or on the ground to increase growth of plantations. Applications of fertilizers have the potential to result in disturbance during the breeding season of species or to affect habitat quality.

Use of forest chemicals may have effects on aquatic amphibians and reptiles, but few specific data are available regarding potential effects on these species. The anticipated likelihood of effects is highly variable depending upon the characteristics of the different compounds and variations in application methodology. A discussion of forest chemical use on the PALCO property is found in Chapter 3.14 of the Final EIS/EIR. In general, the conclusions regarding potential impacts to salmonids are applicable to aquatic amphibians and reptiles.

Use of forest chemicals is not covered under the ITP and this activity remains subject to applicable Federal and State laws including the prohibition on take under Section 9 of the Act. Use of some forest chemicals may be included as a covered activity in the future through an amendment to the ITP. An application to amend the permits would require full compliance with NEPA, ESA and other applicable federal laws and would be subject to public review and comment.

The issuance of a 5-year streambed alteration agreement with the CDFG is also discussed above. Most of the impacts discussed for salmonids would also be expected to apply to covered amphibians and reptiles. Because these impacts occur at localized levels and are subject to the

other restrictions of the HCP, the degree of impact to covered amphibians and reptiles would not be expected to be substantial.

Northern California ESU steelhead

Refer to Effects common to salmonids.

Southern Oregon/California Coasts ESU coastal cutthroat trout

Refer to Effects common to salmonids.

Summary of species response to proposed action

LISTED SPECIES/CRITICAL HABITAT:

American peregrine falcon

Only one peregrine falcon nest site is currently known to exist on PALCO lands, at Scotia Bluffs. Two additional nest sites occur within the action area, but not on PALCO ownership. Future surveys may discover an undetermined number of additional nest sites but suitable habitat is limited. Conservation measures identified in the American Peregrine Falcon Conservation Plan are to be implemented for all present and future nest sites within the action area. If these conservation measures are successfully implemented, adverse effects due to disturbance from timber operations and other covered activities will be minimized. No pesticide-associated adverse effects are expected to occur as part of this action. No active nest sites or potential nest sites are likely to be destroyed as part of this action. Habitat modification may have some adverse effects on the species depending on the resulting habitats likely to be created during the 50 year implementation of the SYP/HCP. However, habitat loss has not been considered as a major threat to the peregrine in significant portions of its range, and has not precluded recovery of the species. In summary, conservation measures are likely to minimize disturbance, injury, and habitat loss for this species to the maximum extent practicable.

Northern spotted owl

The proposed action may affect and is likely to adversely affect the northern spotted owl. The response of the northern spotted owl to the proposed action over the 50-year period is described in relation to habitat conditions (e.g., removal, protection, distribution) and disturbance.

Habitat protection, in combination with the adaptive management strategy, would maintain at least 108 activity centers distributed throughout the PALCO lands. The population level may decline from a total of 156 to 108 activity centers, a potential reduction of 48 activity centers, due to adverse effects associated with the loss, localized distribution, or fragmentation of suitable habitat. In addition, an undetermined number of activity centers may be removed from the population of owls in the action area outside of the action area. The amount (177,173 acres) of suitable habitat at the end of 50 years may moderate these adverse effects and represents a gain of 6,769 acres, compared to current levels.